THE JOURNAL OF GAS LIGHTING
WATER SUPPLY & SANITARY IMPROVEMENT

VOL. LIX. No. 1498.] LONDON, JANUARY 26, 1892. [44TH YEAR. PRICE 6d.

GAS AND WATER PIPES.

1¼ to 12 IN. BORE.

THOMAS ALLAN & SONS,
Bon Lea Foundry,
SOUTH STOCKTON-ON-TEES.

ALSO MANUFACTURERS OF
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— ESTABLISHED 1830. —
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WORKS:
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Special Quotations to Gas Companies.
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PRECEDENTS IN PRIVATE BILL LEGISLATION AFFECTING GAS & WATER UNDERTAKINGS.
1879-1890.

Compiled by EDMUND HERBERT STEVENSON, M. Inst. C. E., F. S. I., and EDWARD KYNASTON BURSTAL, M. Inst. C. E., M. Inst. Mech. E.

This Work (which is a continuation of that published in 1879 by the late Mr. G. W. Stevenson) contains information as to the practice of Parliament during the past twelve years, in regard to most of the points on which differences arise in Opposed Bills for Gas and Water Undertakings. The greatest care has been taken in its compilation; and it is arranged in a very handy form.

***The Work by the late Mr. G. W. Stevenson is still on sale, price One Guinea.

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PATENT PURIFYING MACHINE,

Which has now fully proved itself to be the most effectual, powerful, and perfect Apparatus in the World,
FOR PURIFYING GAS FROM
TAR, CARBONIC ACID, AMMONIA,
and a large portion of
SULPHURETTED HYDROGEN,
Doing all the work of Purification between the Condensers and Purifiers, and relieving them of much work. Its cost is less than any other known Apparatus for purifying Gas from Tar and Ammonia.

Testimonials, Drawings, and Prices on Application.

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IN CAST-IRON CASES,

THE UNVARYING WATER-LINE GAS-METER

AND

IMPROVED DRY GAS-METERS.

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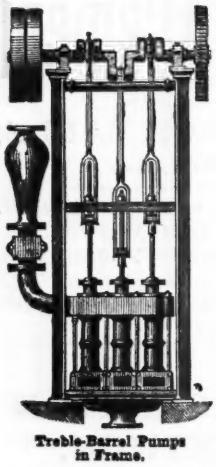
STEAM & HAND PUMPS FOR GAS-WORK

FOR PUMPING TAR, WATER, AND LIQUOR.



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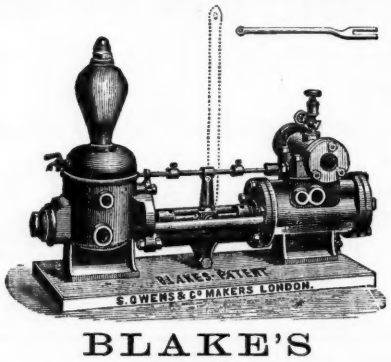

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Improved Double Action Pump.

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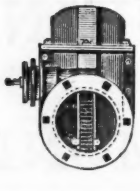

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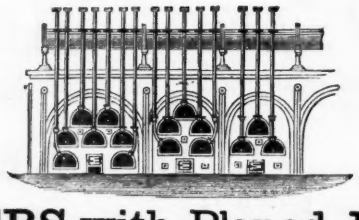

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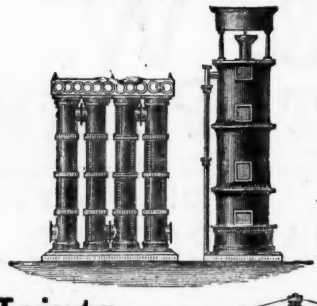

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Also Bye-Pass & Stop Valves.

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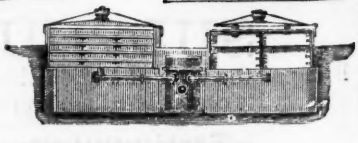

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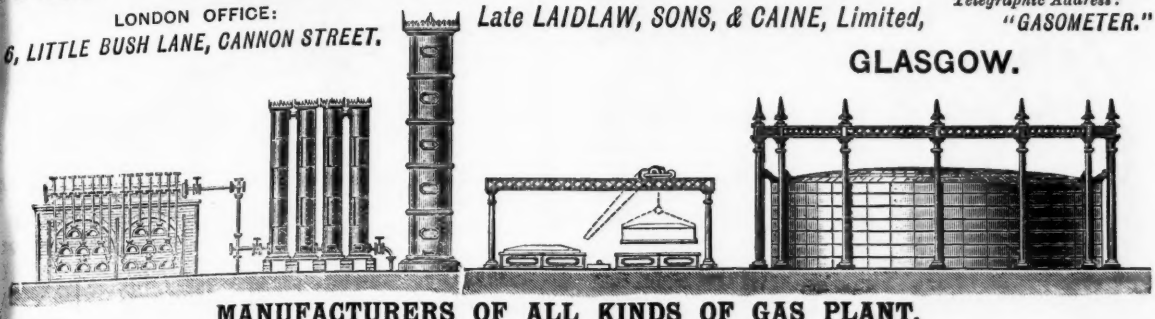

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RETORT-BENCH FITTINGS; SIEMENS'S REGENERATIVE AND ORDINARY FURNACES;
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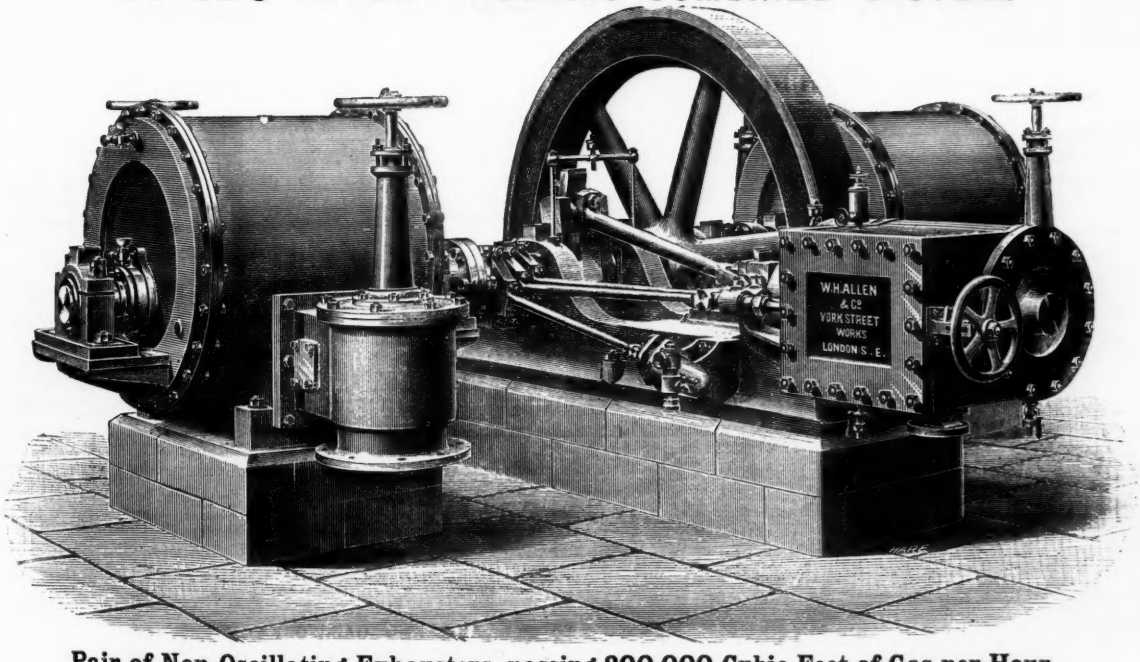

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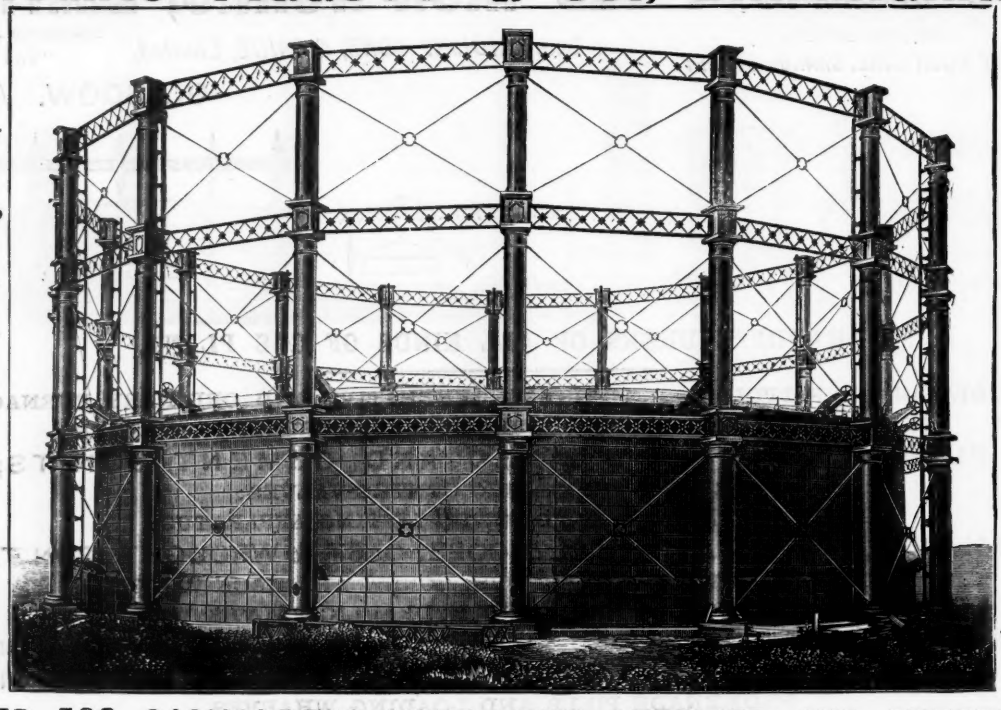

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INCLUDING THOSE SUPPLIED TO THE FOLLOWING GAS COMPANIES AND CORPORATIONS:

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BECKTON.	BRADFORD.	CARDIFF.	LEEDS.	NOTTINGHAM.	RIO GRANDE.	SYDNEY.
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ALBION IRON-WORKS, MILES PLATTING, MANCHESTER,

MANUFACTURERS OF

WEST'S PATENTED MACHINERY

FOR

CHARGING AND DRAWING GAS-RETORTS.

OVER **180** MACHINES AT WORK AND IN COURSE OF CONSTRUCTION.

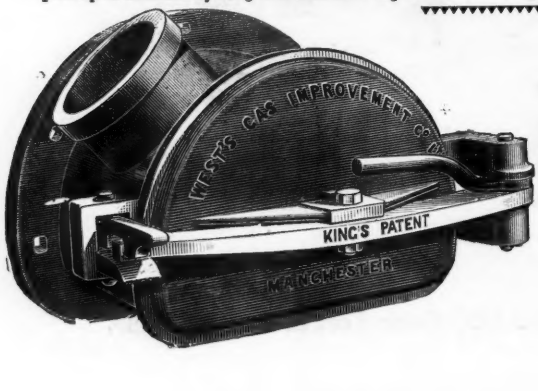
Advantages attending its use are:

INCREASED VOLUME of GAS per TON, and INCREASED YIELD per Retort.—The system of breaking and distributing the coals in an even layer in the retorts effecting more perfect carbonization.

REDUCTION in LABOUR and COST of WORKING.—In Works where this System of charging and drawing Retorts is adopted, there has been effected a substantial saving in the cost of Gas Manufacture in the Retort-House; the amount saved varying in different Gas-Works from **8 PENCE** to **15 PENCE per Ton** of coal carbonized. Full particulars will be forwarded upon application to W. G. I. Company, Limited.

MANUAL CHARGING AND DRAWING MACHINES.

POWER CHARGING AND DRAWING MACHINES, driven by COMPRESSED AIR, STEAM, or ROPE. The power machines are applicable to circular, oval, or ∩-shaped retorts and mouthpieces, and are the most perfect, economical, efficient, and durable machines made. They are constructed on principles founded by long and extensive experience in this special branch of gas engineering and the manufacture of gas.



MAKERS OF COAL BREAKING, ELEVATING, AND CONVEYING MACHINERY, COKE BREAKING AND WASHING MACHINERY.

Sole Makers of CIRCULAR, OVAL, or ∩-shaped MOUTHPIECES with Morton's Self-Sealing Lids, fitted with

KING'S PATENT FASTENINGS,

secure a very tight joint; and at the same time the eccentric motion given to the Lid effectually removes the Tar from the surfaces of the Joint.

N.B.—The whole of these Fittings are made of Wrought Iron. Several Thousands in use.

West's Improved Combined Regulating Liquor Seal Valve.

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Have been made in large quantities for the last twelve years; and during the whole of that time, have been in regular use at most of the largest Gas-Works in the Kingdom. They possess the excellent quality of remaining as near stationary as possible under the varying conditions of their work—a quality which will be appreciated by all Gas Engineers and Managers. The generally expressed opinion is that these Retorts are the very best that are made.

RETORTS CAREFULLY PACKED FOR EXPORT.

Fire-Bricks, Lumps, Tiles, &c., &c., of every description suitable for Gas-Works.

ESTABLISHED MORE THAN A QUARTER OF A CENTURY

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MAKE A SPECIALTY OF GASHOLDERS

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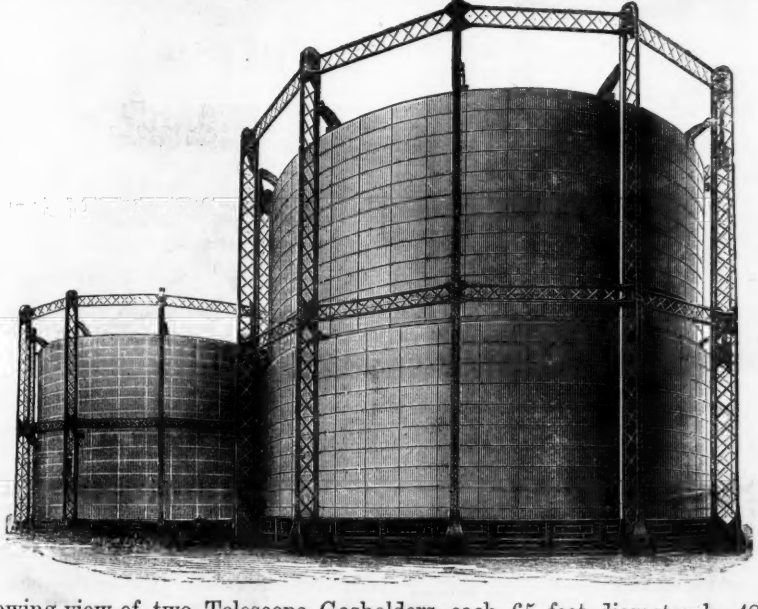

Illustration showing view of two Telescope Gasholders, each 65 feet diameter by 48 feet high, recently erected by Messrs. R. and J. Dempster, in Tanks previously occupied by Single-lift Holders 20 feet deep. The Tanks were made 4 feet deeper, by adding a Tier of Cast-Iron Plates, prepared with suitable Flanges, to meet the Brickwork of a Brick and Puddle Tank. The storeage capacity was thus increased nearly 150 per cent. at comparatively little outlay.

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BEST VALUE IN THE TRADE. MANY SPECIALITIES.

Best for Hiring-Out. No Sheet-Iron Parts.

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SEASON 1892. NEW IMPROVEMENTS TO COOKERS. RICHMOND'S PATENT WHITE ENAMELLED STEEL CROWN PLATE NOW ADDED AT LOW PRICE.

No. 30, 2/-. | No. 40 & 50, 2/6. | No. 100, 3/-. | No. 120, 3/6. | No. 140, 4/-. | No. 160, 5/- sub

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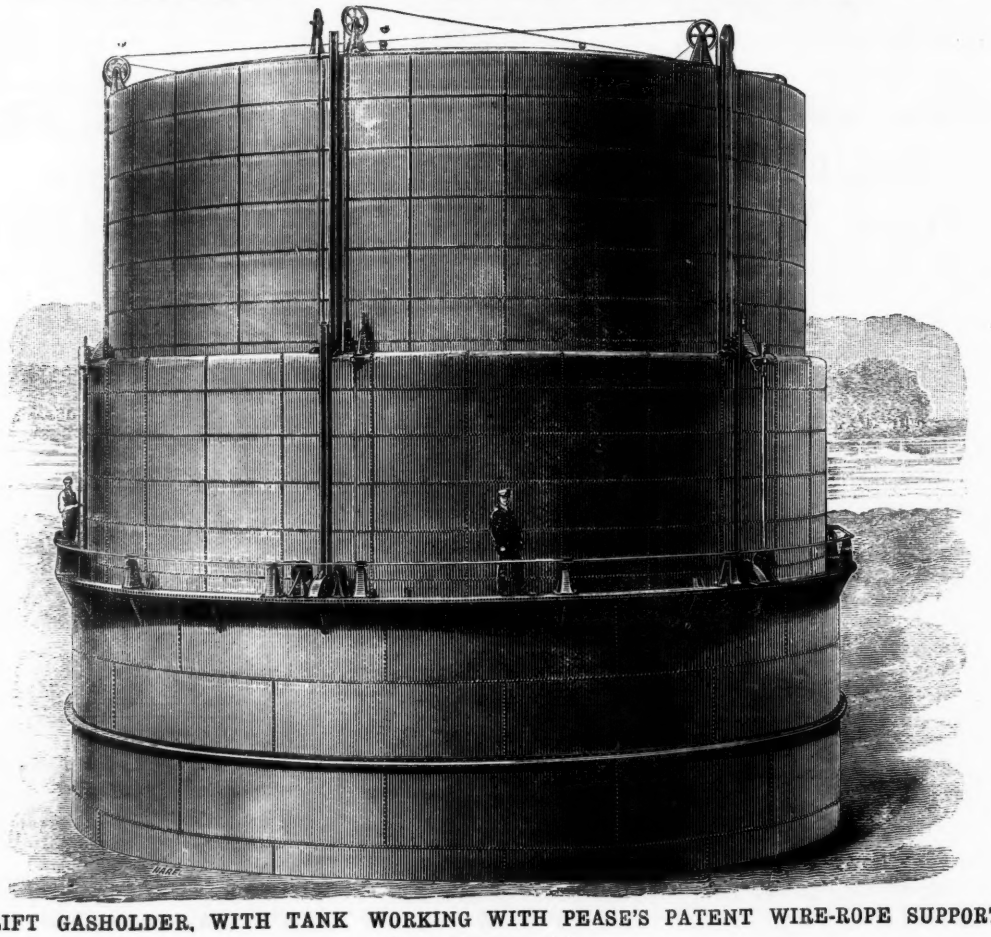
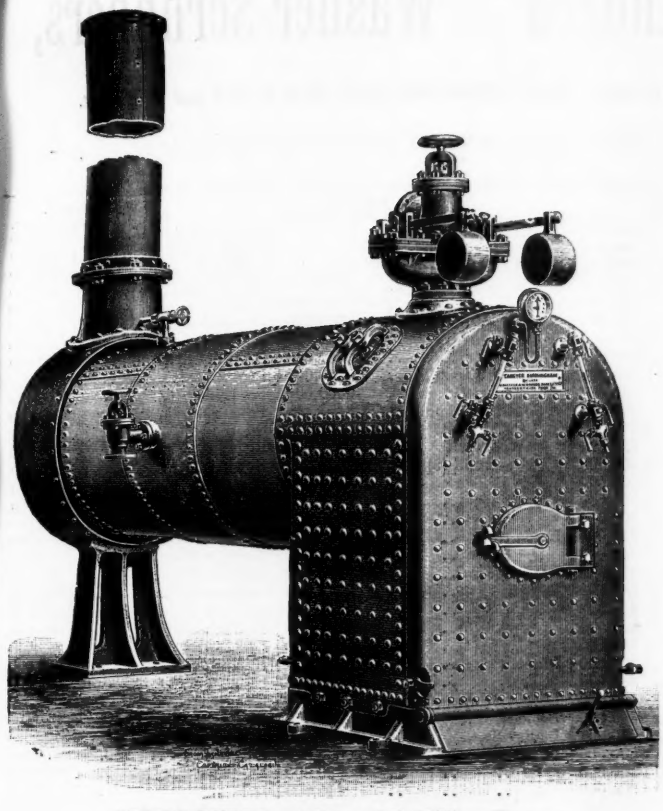
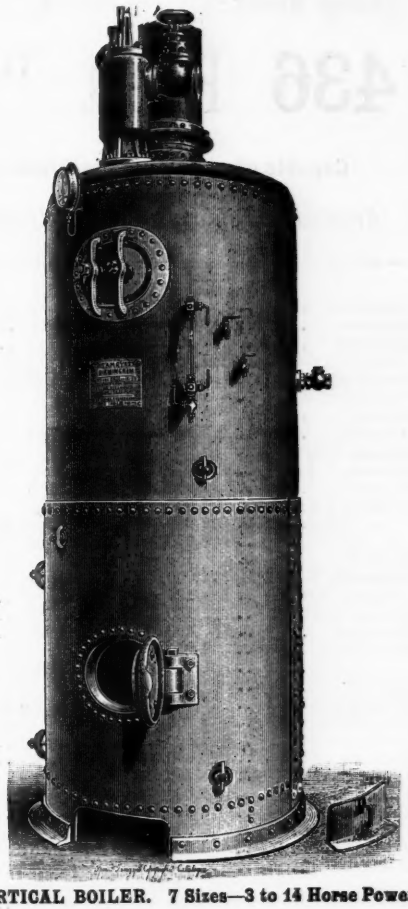


TWO-LIFT GASHOLDER, WITH TANK WORKING WITH PEASE'S PATENT WIRE-ROPE SUPPORTS.
(From Photograph.)

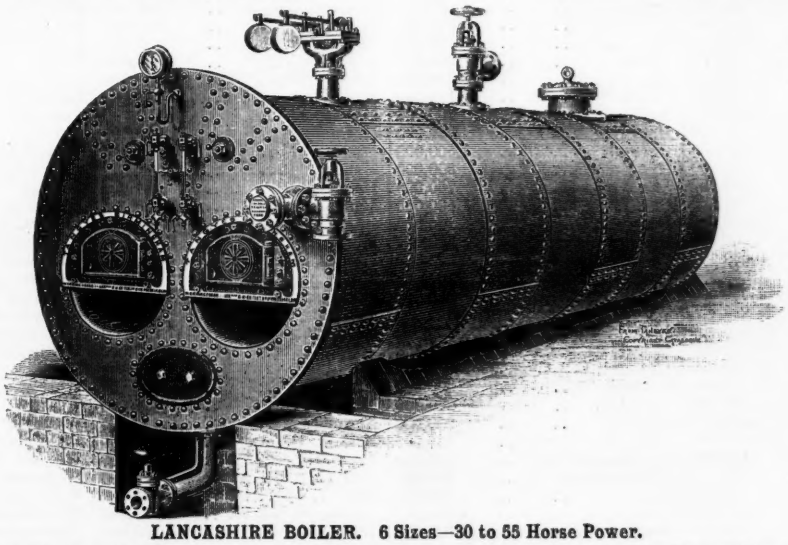
TANGYES' REVISED STEEL BOILERS.



"LOCO." BOILER. 12 Sizes—6 to 40 Horse Power.



VERTICAL BOILER. 7 Sizes—3 to 14 Horse Power.



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[SIDNEY HERSEY, Managing Director.] [J. CHANDLER, Engineer.]

436 Patent "Standard" Washer-Scrubbers,

Capable of extracting the whole of the Ammonia from 410,680,000 Cubic Feet of Gas per 24 hours.

Erected and in course of construction at present date, amongst them being the following, viz.:—

	Capacity. Cubic feet per day.
Altrincham	600,000
Adelaide	600,000
Aldershot	200,000
Allegheny, U.S.A. ..	1,000,000
Ashton-under-Lyne ..	1,250,000
Amsterdam (2) ..	1,500,000
Annaberg	200,000
Arcachon	100,000
Animal Charcoal Co.	200,000
Altoona, U.S.A. ..	350,000
Buxton	250,000
Bradford (3)	1,000,000
,, (3)	1,250,000
,, ...	3,000,000
Bremen	150,000
Baltimore, U.S.A. (3)	1,000,000
Balmain, N.S.W. ..	125,000
Bishops Stortford ..	150,000
Blackpool	400,000
Brussels (3)	1,250,000
,, ...	750,000
Banbury	250,000
Birmingham (2) ..	5,000,000
Birkenhead	2,500,000
Blackburn	1,500,000
Bochum	600,000
Burntisland	250,000
Boston, U.S.A. ..	2,000,000
Brisbane	1,500,000
,, ...	300,000
Burton-on-Trent ..	1,500,000
Barcelona	350,000
Barking	100,000
Baerlien & Co. (2) ..	20,000
Bombay	700,000
Buffalo, U.S.A. ..	550,000
,, ..	500,000
Brooklim, U.S.A. ..	300,000
Bergen	250,000
Berlin..	150,000
Bournemouth ..	1,000,000
Bridgeport, U.S.A. ..	500,000
Brunswick	300,000
Beck & Co., St. Louis	100,000
Barmen Rittershausen	600,000
Bexhill	125,000
Brooklyn, U.S.A. (2)	1,000,000
Brunner, Mond, & Co.	400,000
Cheltenham	2,000,000
Cannes	200,000
Croydon	1,500,000
Copenhagen	200,000
Clevedon	200,000
Columbus, U.S.A. ..	500,000
Cincinnati, U.S.A. (2)	1,500,000
Chicago, U.S.A. ..	3,000,000
,, (2) ..	1,000,000
Chemnitz	1,000,000
Crewe	1,250,000
Colonial Gas-Works Co.	100,000
Cadiz	300,000
Charlottenberg ..	600,000
Dudley	750,000
Driffield	100,000
Dukinfield	500,000
Dover	750,000
,, (2)	1,000,000
Deal	200,000
Derby (2)	1,500,000
,, ...	1,000,000

	Capacity. Cubic feet per day.
Dublin	3,000,000
Dowlais	100,000
Douai	500,000
Denton	500,000
Derby, U.S.A. ..	350,000
Denver, ,, ...	500,000
,, ,, ...	1,000,000
Düsseldorf	750,000
,, ...	500,000
Dumfries	250,000
Dunedin, N.Z. ..	400,000
Darlington	1,250,000
Detroit, U.S.A. ..	750,000
Edinburgh	1,500,000
,, ...	2,000,000
Enfield	300,000
Essen	300,000
Elbing	150,000
Falmouth	150,000
Frankfort	300,000
Farnworth	400,000
Fenton	400,000
Friedenshütte ..	500,000
Fürth	400,000
Freiburg	200,000
Goole	250,000
Glossop	300,000
Guildford	300,000
Gloucester	1,250,000
Gera	300,000
Grafton, N.S.W. ..	100,000
Grieg	300,000
Georgetown, U.S.A.	250,000
Gluckauf	200,000
Heywood	600,000
Holywood	125,000
Huy	70,000
Harrow	250,000
Harrogate	250,000
Halstead	150,000
Heilbronn	200,000
Havanna, Cuba ..	750,000
Hastings	1,500,000
Huddersfield	300,000
,, ...	750,000
,, ...	1,500,000
Hof	200,000
Hampton Wick ..	500,000
Heckmondwike ..	500,000
Haverfordwest ..	100,000
Halifax, N.S. ..	350,000
Hamm	200,000
Halle	400,000
Heidelberg	300,000
Hartford, U.S.A. ..	1,000,000
Ilkeston	300,000
Inverness	250,000
Ilkley	200,000
Ilford	100,000
Kingston-on-Hull ..	400,000
Kidderminster ..	750,000
Kidsgrove	100,000
Königsberg	1,000,000
King's Lynn	300,000
LONDON :—	
The Gaslight and Coke Co. :—	
Beckton (6) ..	1,250,000
,, (2) ..	2,500,000
Silvertown ..	1,000,000

	Capacity. Cubic feet per day.
LONDON—*Continued.*	
The Gaslight and Coke Co. :—	
Bromley (2) ..	2,000,000
,, (4) ..	1,500,000
Shoreditch ..	2,500,000
Pancras (2) ..	1,500,000
Pimlico	2,000,000
Nine Elms (2) ..	3,000,000
Kensal Green (2)	3,000,000
South Metropolitan Co. :—	
Greenwich ..	3,000,000
Woolwich ..	400,000
Vauxhall (2) ..	3,000,000
Lea Bridge ..	300,000
West Ham.. ..	1,500,000
,, ...	3,000,000
Leeds (2)	2,000,000
,, (4)	3,000,000
Leominster	150,000
Leiden	560,000
,, ...	600,000
Liverpool (5).. ..	2,000,000
,, (4).. ..	3,000,000
Lincoln	1,000,000
,, ...	600,000
Lowell, U.S.A. ..	1,000,000
Laclede, ,, ..	1,000,000
Louisville, ,, ..	1,500,000
Long Eaton	500,000
Lille	900,000
,, ...	450,000
,, ...	750,000
,, (2)	250,000
Luckenwalde ..	330,000
Liegwitz	300,000
Lincoln, U.S.A. ..	250,000
Lawrence, ,, ..	500,000
Lynn, ,, ..	300,000
Lyons..	1,500,000
Maidstone	1,000,000
Marseilles (2) ..	1,500,000
Mons	500,000
Malines	250,000
Melbourne (5) ..	1,500,000
Manchester (2) ..	2,500,000
,, ...	400,000
Middleton	400,000
Manley, N.S.W. ..	100,000
Minneapolis, U.S.A...	750,000
Magdeburg	300,000
Memphis, U.S.A. ..	750,000
Nottingham	1,250,000
,, (2) ..	2,500,000
,, (2) ..	2,000,000
,, ...	1,500,000
Newport, U.S.A. ..	430,000
Newmarket	150,000
Newark, U.S.A. ..	680,000
Northfleet	200,000
New York, U.S.A. ..	2,000,000
Nice	600,000
Newcastle, N.S.W. ..	200,000
Numea, ,, ..	100,000
Namur	250,000
Newark	350,000
Nassau, U.S.A. ..	1,000,000
Oldbury	500,000
Otley..	200,000
Oswestry	250,000

	Capacity. Cubic feet per day.
Ober Schlesian ..	1,500,000
Otto & Co.'s Coke Works	1,500,000
Plymouth	2,000,000
Parramatta, N.S.W.	100,000
Prescot	150,000
Providence, U.S.A. (2)	750,000
Plauen (2)	300,000
Portsmouth (2) ..	2,500,000
Pittsburg, U.S.A. ..	1,500,000
Portland, ,, ..	560,000
Pawtucket, ,, ..	500,000
Quebec	250,000
Radcliffe	750,000
Rouen	250,000
Ramsgate	1,000,000
Reigate	200,000
Richmond, U.S.A. ..	250,000
Roxbury, ,, ..	500,000
Runcorn Soap Co. ..	20,000
Rockhampton, N.S.W.	125,000
Richmond	1,500,000
Reading	2,000,000
Reichenbach ..	200,000
Smethwick	750,000
Sydney, N.S.W. (2) ..	1,000,000
,, ..	2,500,000
Sunderland	1,500,000
St Joseph's, U.S.A. ..	250,000
Spa	100,000
Sevenoaks	300,000
St. Petersburg ..	2,000,000
,, ..	1,500,000
St. Louis, U.S.A. (2)	2,000,000
,, ..	1,000,000
Silesian Coal Co. ..	600,000
San Francisco, U.S.A. (2)	2,000,000
Sheepbridge Coal Co.	40,000
Stettin	200,000
Singapore	300,000
Sutton	500,000
Tonbridge	150,000
Tipton	400,000
Tottenham	1,000,000
Toledo, U.S.A. ..	750,000
Toronto	1,000,000
Uxbridge	300,000
Valparaiso	500,000
West Bromwich (2) ..	1,000,000
Willenhall	250,000
Weston-super-Mare..	500,000
Waltham	150,000
Wormwood Scrubs ..	300,000
Williamsburg, U.S.A. (2)	600,000
Wellington	150,000
Warwick	300,000
Wheeling, U.S.A. ..	500,000
Walker	300,000
Westgate	100,000
Wilmington, U.S.A.	500,000
Windsor, N.S.W. ..	100,000
Wolverton	100,000
Wellington, N.Z. ..	250,000
Whitchurch	175,000
Washington, U.S.A.	2,000,000
Wallasey	750,000
Weimar	150,000
Wurzen	200,000
Worcester, U.S.A. ..	750,000
Yeadon	500,000
Yeovil..	250,000

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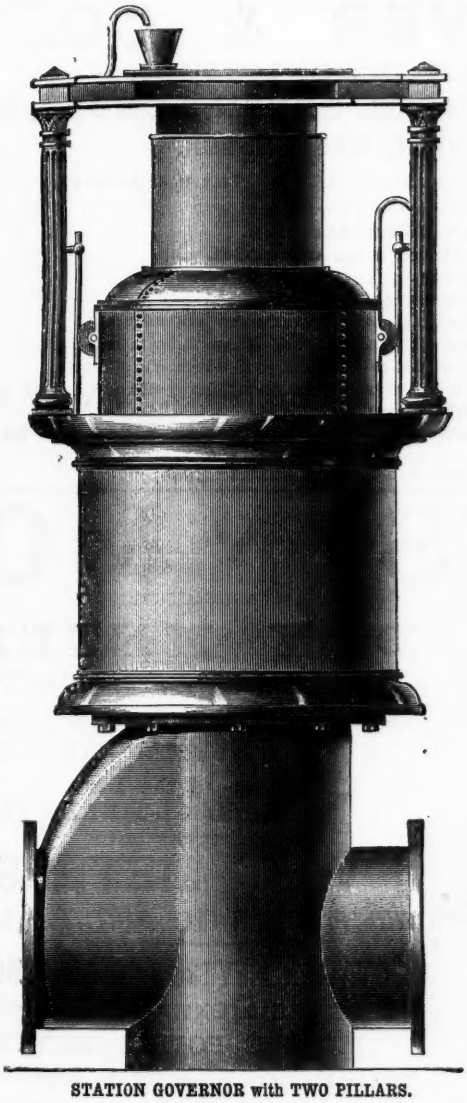
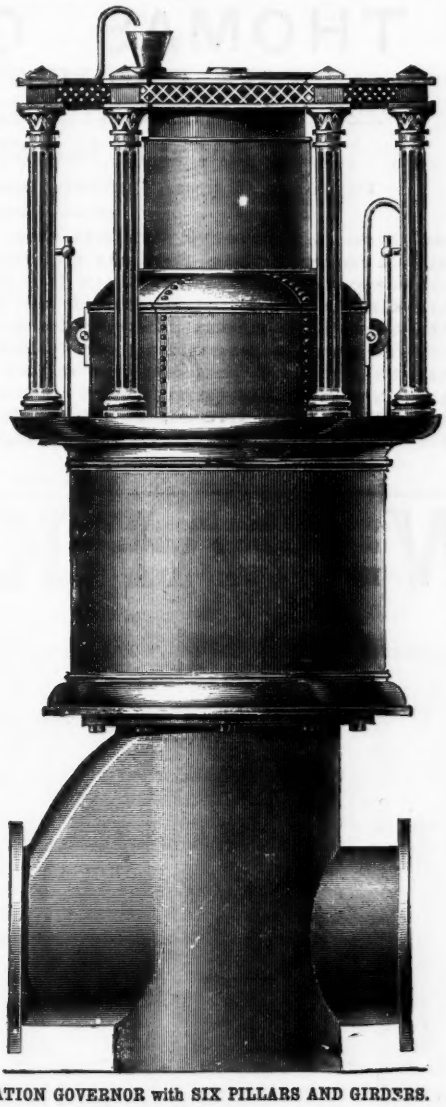


STATION GOVERNOR with TWO PILLARS.



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6th—Prevent jumping or unexpected extinction of the Lights.
7th—May be fixed either above or below the level of the Lights.
8th—Cannot be tampered with without visibly damaging the outer case.
9th—Will last much longer than Wet Meters.
10th—Will not cost more than one-half for repair that Wet or Water Meters do.

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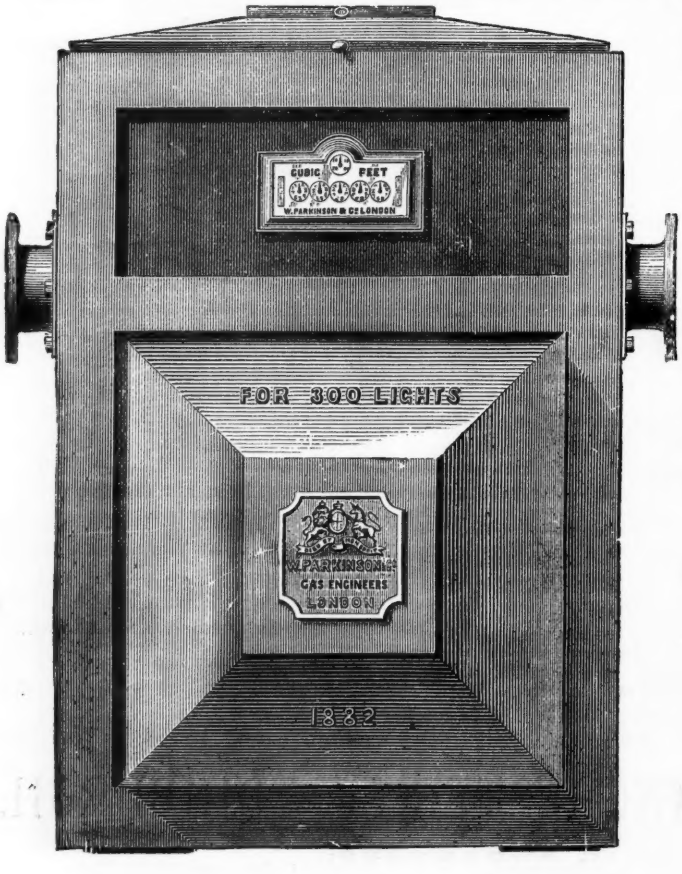

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[See also Advt., p. 180.

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THE
JOURNAL OF GAS LIGHTING,
WATER SUPPLY, & SANITARY IMPROVEMENT.

TUESDAY, JANUARY 26, 1892.

The Chartered Dividend.

THE announcement was made after last Friday's meeting of the Board of The Gaslight and Coke Company, that a dividend after the rate of 12 per cent. on the ordinary stock of the Company would be recommended to the proprietors at the forthcoming general meeting. This is a drop of 1 per cent. for the half year, which the proprietors will not like. The question remains, as to what extent the reserve has been drawn upon to pay even this reduced rate of dividend. All comments upon the financial condition of the Company must, however, be reserved until the accounts relating to the past half-year's working have appeared; but it would be affectation to pretend that anybody expects that these will present a satisfactory aspect, in face of the recent serious rise in the price of gas, which has been marked with murmurings of discontent both loud and deep from all classes of the Company's consumers, public and private. The circumstance of some of these complaints going outside the mark, and losing their point in irrational vituperation against the action of a band of "irresponsible monopolists," as the Directors are styled in some published protests against the rise in price, is not to be taken as an excuse for neglecting these symptoms of popular dissatisfaction. Some of the newspaper critics of the Chartered Board appear to think that they have withered the subjects of their injurious remarks by merely calling them "monopolists;" while a few Vestries have vapoured about patronizing electric lighting. It has also been urged that such a serious tax upon the Chartered Company's district as is involved in an increase in the price of gas by 4d. per 1000 cubic feet ought not to be levied without the consent of the Board of Trade. Again, the assertion is widely offered that the recent increase in price is made arbitrarily, merely in order that a few "bloated capitalists" may continue to divide enormous profits. All these expressions of the popular discontent, with others of like quality that need not be stated here, but which will recur to readers of the London newspapers, can be dealt with gaily by such accomplished masters of verbal fence as Colonel Makins, M.P., the Governor of the Company, and the Secretary and General Manager, Mr. John Orwell Phillips, who so recently had an "innings" in the columns of the *Daily News*, and therewithal claimed to have scored a win for his Company "off his own bat." We take the liberty of reminding these gentlemen, with all due respect, that this sort of thing may be "magnificent;" but it is "not war." A victory of words over a not very incisive critic, or an easy bedazzlement of an amiable newspaper reporter, will not meet the case as it can be presented by anyone who knows the open secret of good gas management. The motive with which competent critics will scan the forthcoming accounts, and watch the proceedings at the general meeting on the 5th prox., is no more nor less than the justifiable desire to ascertain whether the actual condition of the largest gas undertaking in the world is explainable by circumstances, or reflects in any way upon the quality of its management. The Administration of the Chartered Company has on former occasions betrayed a restiveness under criticism which is no indication of strength. The Governor has uttered remarks, which he evidently meant to be scornful, respecting the judgments of "irresponsible "critics" upon the Company's management; and we have had to remind him that the Chartered Board are no more exempt from criticism than any other public or *quasi*-public body. For the present, it will be sufficient to enumerate the following counts in the indictment which public opinion is now bringing against the Horseferry Road Administration, and of which it must be admitted that they are solid enough and grave enough to deserve the most devoted attention of any Board of Gas Directors who might be similarly challenged. These are: First, that they cannot sell gas of the same quality under 7d. and 9d. per 1000 cubic feet respectively in excess of the prices asked by their smaller neighbours. Secondly, even at this advanced price they cannot earn the dividends they declare.

The explanation of these facts, the former of which is the chief concern of the public, as the latter is of the proprietors whose trustees the Directors are, must be sought among the various considerations which are to be classified under the heads of circumstances and management. The circumstances affecting the business of gas supply in London do not apply only to one of the Metropolitan Gas Companies. They affect all; and if they do not work the same results in all, that is a question of internal constitution and management. Constitution is, after all, an affair of administration or management, for the arrangements of a gas company are not unalterable by superior power; and we opine that, if the public were told that there is something in the constitution of a gas undertaking which has the practical effect of preventing its managers from selling gas as cheaply as might be, there would soon be a movement for demolishing the obstacle, whatever its nature. In the present instance, the constitutional conclusion that forces itself upon an observer of Gaslight and Coke affairs is that amalgamation has apparently failed of its sole public justification—keeping down the price of gas to the lowest possible figure. If it is denied that amalgamation, as

a principle, is discredited by the present peculiar condition of the Chartered district with regard to the price of gas, there is no escape from the alternative explanation that the trouble must be due to special causes—that is to say, to bad management.

The forthcoming accounts will be diligently searched for the evidence for and against this ultimate conclusion, which they must disclose under the headings of capital outlay and working expenses. But the accounts are, after all, only the record of the life that the organism has lived. They do not disclose the causes which have made them what they are, the continued operation or the cessation of which in the future is of even greater moment than their past results. Hence the most interesting subject of discussion at the present time, with regard to the affairs of The Gaslight and Coke Company, is not what the half-year's accounts may disclose, but how they are brought about. For it is notorious that there have been shifts and changes among the head-quarters and distributed staffs; and there is a notion abroad that these changes indicate the existence of grave troubles in and about the organization. When speaking of the affairs of the Company, the Governor, as well as every other responsible spokesman for the Administration, has shown an apparently incurable tendency to overwhelm inquirers with big figures descriptive of the scale of the Company's operations. "Do you "know how much gas we make, how many men we "employ, how much coal we buy every year?" This is the burden of the Horseferry Road apologists. It is necessary, therefore, to remind all whom it may concern, on the eve of the general meeting, that these glorifications of mere bulk are wholly beside the mark. A big gas undertaking may be as easily mismanaged as—more easily perhaps than—a small one. It is perfectly idle to think that a dissatisfied critic can be buried, argumentatively, under a vast heap of coal. He will still ask: "Is "your gas economically made? are your men profitably "employed? and do you buy your coal as cheaply as you "might?" If one of these questions cannot be satisfactorily answered, then the bulk of the operations to which it refers only aggravates the evil. If we were to urge the Chartered Board to forget the magnitude of their business, the advice would be taken in a wrong sense; but what has bulk to do with such questions as, "How is your capital being laid "out? what is the average production of your "carbonizing plant per mouthpiece? how much "coal do your men handle for their wages? how "does your fuel account stand? what is your true make "per ton? are your works fairly proportioned and well "arranged? and is your general system of business "good?" These are subjects of consideration which cannot be set aside by picturesquely comparing the revenue of The Gaslight and Coke Company to that of the Kingdom of Greece, or by constructing an imaginary Eiffel Tower of the daily output of the Company's stations. Let us conclude this essay in "irresponsible "criticism" with a respectful intimation to Colonel Makins that the only effectual way for the Board of which he is the official head to shake off hostile critics of their administration of the undertaking, is to rise superior to censure. It will not do to assert *ore rotundo* that "all "is for the best in the best of all possible" gas companies, when the gas bills of London exhibit such very startling contrasts as they do between East and West, and North and South.

Law Reforms.

THE whole of the business community is interested in the measures now being discussed with the object of restoring the efficiency of the High Court of Justice in regard to the determination of commercial actions; and we therefore make no apology for alluding here to the suggestions to this effect contained in the report of a Joint Committee appointed by the Bar Committee and the Incorporated Law Society, which was recently submitted to the Lord Chancellor and the Judges. The reproach of dilatoriness does not apply to this Committee; for its members were only nominated on the 7th and 11th ult., and they reported within little more than a month, notwithstanding the intervention of the Christmas vacation. Well may all suitors marvel at the disparity between this celerity and the sluggishness with which the legal profession usually deals with the affairs of third parties. The recommendations of the Joint Committee, moreover, are as incisive and business-like in character as their production has been prompt. It cannot be doubted that they were carefully considered at the Grand Council of the Judges which was held yesterday week; and something is sure to transpire at no distant date to indicate the views of the occupants of the Bench respecting these practical suggestions of the solicitors and barristers. In brief, the gist of the proposals is that a separate list, to be styled the "Commercial List," should be established for the entry of commercial actions for trial in London and Middlesex; and that this list should be disposed of, apart from all other work of the Queen's Bench Division of the High Court, either by a Judge of this Division specially assigned by the Lord Chancellor for the purpose, or by one permanently added to the Probate, Divorce, and Admiralty Division for the trial of commercial actions. Questions relating to patents, commercial contracts, dealings with or in relation to mercantile property of any kind, and similar matters, would naturally come into this classification. It is believed that in practice there would be very rarely any difficulty in deciding what is properly a commercial or mercantile action. Either party should have the right of entering causes in this list; and the actions would be heard by the Judge, sitting with or without assessors, and with or without a special jury. All the incidents of every suit would come under the cognizance of the Judge; and it is suggested that when the Commercial Court has been constituted, it will become a matter for further serious consideration whether or not the present system of pleadings, and the rules of evidence, might not wisely be modified in commercial actions. All this we cordially support. It is clear, as the Committee suggest, that commercial suitors "want a reduction of the expenses of litigation in the "stages preliminary to the actual trial, a means of ascer-"taining with a tolerable degree of certainty when the "trial will take place, and a speedier process in getting to "the trial than is given to them now." They also want a better assurance that the bearings of their cases, when these involve technical points, are properly grasped by the Judge than they get by the present extravagant and unsatisfactory method of pitting expert against expert in the witness-box. If the recommendations of the Joint Committee did no more than aim a blow at the "expert witness" abuse, we should regard them favourably. They do more than this, however; and we esteem the general idea of a Commercial Court a very practical and most hopeful one. The lawyers have evidently not been blind to the fact that whereas the Admiralty Court commands the confidence of the mercantile community, the other Divisions of the High Court of Justice have lost, if they ever had, this testimony to their usefulness to the commercial world. Let us hope that the grievances of suitors will, as far as possible, be remedied, now that solicitors, advocates, and judges agree in admitting that the present system requires to be reformed.

Gaseous Fuel and Fog Prevention.

A CLEARLY-STATED contribution to the fog literature of *The Times* recently appeared, with the signature "R. "Russell," which argued, in most conclusive fashion, that if fuel were burnt in London without the production of smoke, the excessive prevalence and noxious character of London fogs would be simultaneously abolished. This argument was put forward to meet the remarks of those who depend upon Mr. Aitken's experimental results for supporting the opinion that, even if all the fuel burnt in London were smokeless, the London fogs would be, in most essentials, as pernicious, if not as black, as ever. Mr. Russell demolishes this contention, which he describes as an illustration of the "danger of making large generaliza-"tions from interesting but inadequate experiments in the "laboratory," by referring to the examples of the South Wales towns in which anthracite is burnt, and to the alteration produced in the atmosphere of Pittsburgh (Penn.) by the introduction of natural gas. He points out that the mischief of coal smoke is that it hinders the dissipation of natural fog, and prevents the ascent of low-lying strata with all their impurities, which naturally occurs when the sun is able to penetrate the mist and warm the earth. The products of combustion, with their specially mischievous solid and tarry particles, are consequently poured downwards, and beaten to a low level, with increasing density as the proportion of artificial matter increases. "Coal

"smoke alone prevents the dissipation of fog which usually "takes place in clear anticyclonic weather in the neigh- "bouring country." Mr. Russell winds up this part of his argument by dogmatically stating that "no large town "exists which burns only smokeless fuel of any kind which "is troubled with fog, mist, or cloud in the slightest degree "above that of similar situations in the surrounding "country." So far, good. But unfortunately for his reputation for consistency, this writer, with all his ability for stating a case, cannot finish his letter without falling into the common error of ignoring facts, and asserting that a certain arrangement, which he mentions, would have results of a particular kind, whereas it actually does nothing of the sort. How often does a good controversialist "let 'himself out," as the Yankees say, in this fashion! Given an "if," and we are fully assured that all sorts of consequences may be expected to follow; whereas we may be able to point to illustrations where the premiss exists, yet the predicted results fail to show themselves. In this case, Mr. Russell says, as though the statement admitted of no dispute, that "municipal control of heat- "ing systems, especially of gas supply, would give "facilities for improvement which do not at present exist." Well, what of the examples of this control which have exhibited themselves to the community for many years—Manchester and Birmingham to wit? Have these Municipalities done anything to disestablish their local fogs by reducing the price of gas to its lowest manufacturing cost? Not at all. They have subsidized their ratepayers; and this is what the Progressives of the London County Council would do to-morrow if they could get possession of the revenues of the Metropolitan gas undertakings, and nobody would be one penny the better.

Deeds, not Words.

An American gentleman, to whose projects in the department of water-gas manufacture we have paid some little attention—Mr. Henry C. Rew—has favoured us with a somewhat impassioned letter protesting against the slighting way in which he evidently considers that we have commented upon his "latest" suggestions in this line. Mr. Rew also transmits for our edification a copy of an American technical newspaper which we rarely see, but which is evidently one of the ordinary run of subsidized manufacturers' "organs" that flourish in the hotbed of M'Kinleyism, containing a description of a yet later scheme of his. He wishes to offer a reward of £1000 to anybody who can beat his methods; but he has forgotten to put up his stake. Anyhow, he desires to impress the world at large, through us, that he, Henry C. Rew, of Chicago, is somebody to be taken seriously, as befits the case of a man who can say absolutely the last word upon such an important subject as the manufacture of water gas. Well, it is not only for the behoof of Mr. Rew that we take the trouble to mention his claims in these columns, but quite as much for the sake of the somewhat numerous tribe of projectors—called in the great American language, we believe, by the expressive name of "process-cranks"—and their victims. We have in the course of every year to deal with a considerable number of this sort of geniuses, who never make anything beyond promises, but who are profuse of offers to stake their reputation—whatever this may stand for—or even their money (which they never show), upon the superiority of their schemes to all others that can, may, shall, or will be mentioned in the same breath with them. To hint, ever so gently, to a gentleman of this order that an ounce of performance is worth a ton of promises, is generally regarded as a deadly insult. Yet, necessarily painful as the effort very frequently is, we are obliged to adhere to this elementary method of testing unrealized professions. Now, in this case of Mr. Rew, who wants to bet £1000 upon the superiority of his "methods," is it unfair to ask where, and to what extent, these methods have objective existence? There are so many projectors who cackle before they have laid their egg, that one can never be too careful in making sure of the order in which these phenomena stand, especially when one is proposed as evidence of the other. The editor of a technical publication is regarded as the natural recipient of every schemer's protestations of ability to work wonders. He cannot help giving ear to these tales; but, however trusting and credulous he may be originally, he grows wary in the end. The existence of an editor of a technical journal who is not open to give "bold advertisement" in his free and independent columns to anything and everythtng that may be brought to him with recommendations of a sterling or negotiable character, is likewise a fact incomprehensible to certain minds. The warning which we should be grateful if all our readers and correspondents would bear in mind, lies in the reminder that conductors of technical papers have an unconquerable predilection for accomplished facts. Let it be wrapped up never so cleverly, both newspaper writers and newspaper readers unerringly detect promise under the disguise of performance, and presumption arrayed as observation. Even when an editor sells himself to palm off the former for the latter, it avails nothing, for the least critical of readers can always see through the pretence. Wherefore, all projectors of great schemes and proclaimers of the standard of perfection in any technical matter should take heed that they deserve respect by their deeds, before claiming it for their words.

Title and Index to Volume LVIII.—The title-page and index to Vol. LVIII. of the Journal (July to December, 1891) will be ready to-morrow; and, as usual, a copy will be forwarded post free by the Publisher, on receipt of a post-card from any subscriber.

The Use of Gas for Melting Snow.—Although the fall of snow during the present winter has been small in comparison with that of 1890-91, it has nevertheless brought forward the usual number of suggestions, more or less feasible, for getting rid of it. Among other propositions, the use of ordinary coal gas has been mooted; but its absurdity can be seen by comparing the known heating value of gas with the work to be accomplished, This has been done by Mr. Thomas Fletcher, F.C.S. He shows that 6 inches of average snow, when melted, becomes ½ inch depth of water, 24 square feet of which will weigh 62½ lbs., or 23·4 lbs. per square yard. At this rate the snow on a mile (1760 yards) of street 20 yards wide would, if 6 inches deep, weigh 823,680 lbs., or 363¾ tons. The heating power of London gas is 660 units per cubic foot; and of this we may take it that, as a maximum, 500 units could be utilized. It has been proved repeatedly and beyond question that 1 lb. of snow at freezing-point requires 150 units of heat to melt it and raise the temperature of the water obtained to 40° Fahr.; and this effect would be produced on 3¾ lbs. of snow by the consumption of a cubic foot of coal gas. From the above data, it will be found that to melt the snow in the assumed mile of street would require the consumption of 247,000 cubic feet of gas, costing, at 3s. per 1000 cubic feet, a little more than £37, or at the rate of £3256 per square mile. As there are a great many square miles of streets in many towns, and as the snowfall has already been nearly double that assumed, Mr. Fletcher says it will be seen that the problem is certainly not one to be solved by this method. Even assuming that the cost of gas and labour were not prohibitive, the fact that the ground itself is usually colder than 32° Fahr. must be taken into account; and the ground would also have to be warmed, or a thin surface of glassy ice, of the most slippery and dangerous kind, would remain after the snow was removed. This alone would condemn the project as unworthy of consideration.

Another Ammonia Engine.—Particulars have already been given in the Journal of the Campbell ammonia engine. Another motor of this class, the invention of Mr. P. J. M'Mahon, is being tested in the grounds of the Chicago Exhibition, with the view of its utilization in drawing street cars. It is operated by anhydrous ammonia; and it consists of a double engine, of the same form and appearance as those used in small locomotives. The ammonia, as a liquid, is carried in a drum contained in an iron tank under a pressure ranging from 150 to 185 lbs. This drum connects with a similar drum, which serves the same purpose as the steam dome of a boiler—that is, to give dry gas. In a part of the iron tank separated from the ammonia is a certain quantity of water, into which the exhaust is discharged and absorbed. As the affinity between water and ammonia is great, the absorption is produced with considerable rapidity; and no back pressure, or practically none, takes place. The cylinders of the engine are enclosed in a tank, so that the gas escaping from leaks is at once absorbed. This arrangement also prevents freezing of the cylinders. When the gas has been used to such an extent that the pressure is insufficient to operate the motor, the car is run into the generating station, the spent liquor withdrawn, and the gas-tank filled again. The liquor is then pumped from the receiving-tank to the generator, where the application of heat serves to separate the gas from the water; the gas passing into a separator, where it is freed from the small amount of water carried over as steam, and then passes on to the condenser, which consists of a number of pipes, where a constant stream of water, flowing over the pipes, cools and condenses th gas to a liquid, which then passes into the supply-tank. The heat in the generator serves to expel the greater portion of the gas, so that nearly pure water is left; and this is withdrawn from the generator and stored in a tank until used to supply the absorption-tank on the motor. It is asserted that the cost of operating the motor is small; and improvements are being effected which will make the machine still more economical.

WATER AND SANITARY AFFAIRS.

THE precise form in which the inquiry is to be conducted by the forthcoming Royal Commission on the Water Supply of London is set forth in the letter from the President of the Local Government Board, addressed to Sir John Lubbock, and read at the meeting of the County Council last Tuesday. The Commission will have to inquire, in the first place, whether, taking into consideration the growth in the population of the Metropolis, and the districts within the limits of the Metropolitan Water Companies, and also the needs of the localities not supplied by any Metropolitan Company, but within the watersheds of the Thames and the Lea, the present sources of supply of these Companies are adequate in quantity and quality. In the next place, if the Commissioners consider these sources to be inadequate, they will have to enter into the question whether such supply as may be required can be obtained within the watersheds referred to, "having due "regard to the claims of the districts outside the Metro- "polis, but within these watersheds." Finally, if the two watersheds are unequal to the demand thus to be made upon them, the Commissioners will have to debate the alternative of going outside that area in order to obtain the requisite supply. At the outset, the sufficiency and suitability of "the present sources of supply" come under review. So far as quantity is concerned, there need be no doubt as to its adequate nature, as compared with the present population. As the population increases, the Companies will, of course, extend their works, and enlarge the volume of water sent through their mains. The next step in the inquiry is whether the watersheds have due capacity for supplying all demands. There is a coming generation, and there are localities not yet supplied by any Metropolitan Water Company, but which have an indefeasible claim on the water which may be obtained within their area. Still, we would observe, there is no proof forthcoming to show that the resources inherent in the watersheds are unequal to the supply of the requisite quantity of water, so that the entire population may enjoy an ample provision, allowing for all probable addition to the number of the inhabitants for many years to come. If the London Water Companies have at any time tapped the natural resources of a district, they have also given back an adequate supply through their pipes, while taking the surplus quantity for more general use. We must say that the instructions to be given to the Royal Commission, as recited in Mr. Ritchie's letter, constitute a very large order. Are the Royal Commissioners going as far as Banbury Cross with their investigations? If they are, they will still find themselves within the watersupshed of the River Thames. If they purpose taking a supply from some remote region, what is to be done with the supply which exists at home? Is it contemplated to supplement the existing sources, or to supersede them? How far will the Commissioners be expected to look into the future—forty, fifty, or a hundred years? and if they look so far, will their prescience be correct? A Ministerial statement in the House may be expected to throw further light on these topics. The subject seems widening out almost to the dimensions of a national inquiry, especially if some huge gravitation scheme is to be entertained.

Although the Royal Commissioners charged with the inquiry into the Metropolitan Water Supply will deal with the subject according to their own will, within the limits laid down in their instructions, it will yet be interesting to consider at this stage what are the facts they are likely to meet with. Concerning the quantity, a writer in the current number of the *Quarterly Review* goes carefully into the subject, and gives good reasons for accepting, "without "hesitation," the total estimate of 300 million gallons per day as the quantity which may be obtained, on behalf of London and its environs, from the Thames and the Lea, supplemented by water from springs and wells. It is further calculated that when the constant supply becomes universal through the districts of the London Water Companies, 25 gallons per day will be sufficient per head of the population, including the use of water for all purposes. At this rate, 300 million gallons per day would suffice for the wants of 12 millions of people—a population which London and the surrounding parts are not likely to possess until at least sixty years have passed away. Twenty large towns, where the constant service is given, show an average daily consumption, for domestic use, of 14 gallons per head. The addition to be made for purposes other than domestic varies in different towns from as low as two or three, up to nine or ten gallons per head. Respecting quality, the Duke of Richmond's Commission reported in 1869 that they saw no reason to believe that the water supplied by the Companies was otherwise than "generally good and wholesome." Speaking of the germ theory, and the objections founded upon it in reference to the London Water Supply, the Commissioners in 1869, after giving "respectful attention" to such objections, said: "We cannot admit them as sufficiently "well established to form any conclusive argument for "abandoning an otherwise unobjectionable source of water "supply." Such having been the results arrived at in 1869, official evidence abounds to show that the quality of the supply has been materially improved since that date. An immense advance has been made in filtration; and other improvements have been effected. These and other facts are adverted to by the writer in the *Quarterly Review*, whose sober and temperate article cannot fail to have weight with every candid reader. The article has been called a "defence of the Water Companies;" but the defence is furnished by the authoritative and independent witnesses who are cited. The *Daily Chronicle* has endeavoured to make it appear that the Duke of Richmond's Commission "condemned" the Metropolitan Water Supply. How far this is true may be judged by the quotations we have made from the report of that Commission.

Electric v. Gas Lighting in Japan.—It is stated that the results of the electric lighting experiment which has been tried at Tokio have been so unsatisfactory that, at all events for the present, no further attempts will be made to carry on the scheme. It seems that the agreement entered into between the Municipality and the Electric Lighting Company stipulated for the lighting of the streets at a certain figure, much below the cost of gas; and complaint is now made that there is a very considerable falling off in the illuminating power of the lamps after midnight—the inference possibly being that the Company are working down to their contract price. It is further complained that the lighting is not so well distributed as with gas; the standards having been put up at such great distances from each other that there is a considerable amount of unlighted space between them. It is suggested in a local newspaper that the new system should be employed in the illumination of the more open spaces only; gas being retained for the narrow streets, which are decidedly in the majority in all Oriental cities, and require well-distributed lighting. But it looks as though the Municipality had now had enough of their experiment with electricity.

The Gas Examinership for the City of London.—We understand that Mr. H. Leicester Greville, F.I.C., Chemist to the Commercial Gas Company, is a candidate for the position of City Gas Examiner, vacant by the death of Mr. Charles Heisch. Mr. Greville, prior to his present position at the Commercial Gas Company, had ten years' official experience of gas testing at stations under the control of the late Mr. T. W. Keates and Mr. Heisch, and he has had altogether upwards of twenty years' almost unbroken experience in practical photometry. He has, in addition, been a more or less constant contributor to the literature of the subject. Another candidate for the appointment is Mr. W. C. Young, F.I.C., F.C.S. This gentleman is at present one of the Gas Examiners to the Corporation; and he also fills a similar position in connection with the local authorities of West Ham, Hastings, Bedford, and other places. His writings on the subject of photometry have appeared from time to time in our columns; his latest article being given in the first number for the current year. Professor Vivian B. Lewes, F.I.C., F.C.S., F.P.S., is also in the field. Having been principal assistant for several years to the Chief Gas Examiner for the Metropolis (Dr. A. W. Williamson, F.R.S.), and subsequently an Assistant Gas Examiner in the City for upwards of ten years, it was naturally to be expected that he would offer himself as a candidate for the vacant post. Professor Lewes's name has been much to the front of late years, as a lecturer and an author, in connection with gas and allied subjects. He is Professor of Chemistry at the Royal Naval College, Greenwich. Professor William Foster, M.A., Lecturer on Chemistry at the Middlesex Hospital, has likewise submitted himself as a candidate. Mr. Foster is so well known to our readers and the gas world generally, that it is unnecessary to enumerate his many qualifications for the position he seeks. Of the other candidates, Dr. Rideal was mentioned in the JOURNAL last week; and Dr. W. Newton, F.I.C., F.C.S., and Professor Otto Hehner, F.I.C., F.C.S., are both analytical chemists of considerable experience. With so much excellence to select from, the task of the Common Council will not be an easy one.

ESSAYS, COMMENTARIES, AND REVIEWS.

GAS AND WATER COMPANIES IN THE STOCK MARKET.

(For Stock and Share List, see p. 166.)

THE Stock Markets continue in the dull and inanimate condition which we noted in our last issue. The even tenor of business last week was broken by the closing of the Exchange on Wednesday, and was to some extent interrupted by the darkness over the land on Thursday; but, apart from these incidents, there was nothing in the financial atmosphere to account for the stagnation of business. We can only suggest again the depressing effects of the influenza. Things would probably have been flatter but for the cheapening of money. The Bank rate was lowered on Thursday to 3 per cent. from the 3½ per cent. rate at which it had stood since the 10th of December; and in the market almost any amount of money could be had on very low terms. As well as can be foreseen, the market is likely to remain easy for some time to come. The Gas Market has been very fairly active, especially in regard to the heavier issues. Interest naturally centred in Gaslights. On Friday, the announcement of the Directors was made that they would recommend a 12 per cent. dividend, as against the 13 per cent. rate of the corresponding period last year. This announcement was not accompanied by any statement of figures with regard to the amount carried forward; so that we have no clue to the working of the half year, and must possess our souls in patience until the accounts come out. Seeing what the prices of residuals have been, and taking other circumstances into account, it is impossible to form any sanguine anticipation about them. But be this as it may, the reduced rate of dividend is clearly a judicious step. The announcement had but little effect upon the market price; for the quotation, which had fallen 1 on Thursday, and again 1 on Friday, was unchanged on Saturday, and the closing price was fair. The "K" has improved 2; and the "H" was steady. [In our last issue, by a printer's error, it was stated that the "H" returns 3s. 8d. per cent. more for money than the "B;" for 3s. 8d. read ⅛.] South Metropolitan were firm; and the "C" rose 5. A few bargains were marked in Commercials at middling figures. Suburban and Provincials are unchanged. Of the Continentals, Imperial was firm and active; but Continental Union receded 5 upon realizations of the recent liberal rise. Cagliari is 1 better. Of South Americans, Buenos Ayres rose ½; but San Paulo was ¼ worse. The only other move was a smart advance in Chicago bonds. The Water Companies were more active, and, on the whole, steady. Grand Junction advanced 4 per cent.; but Kent fell 2.

The daily operations were: The Gas Market was quiet on the opening day; but prices were very good, though quotations did not move. Grand Junction Water rose 2. Tuesday was also a quiet day, and fully as firm. Gaslight "K" rose 2; Cagliari, 1; and Chicagos, 1½ and 2½ respectively. Kent Water fell 2. The House was closed on account of the Royal Funeral on Wednesday. Thursday was active. Gaslight "A" was a little weaker, and fell 1. Buenos Ayres advanced ¼. On Friday, Gaslight "A" was put down 1 more; but business was done at 221. Continental Union also fell 5; but South Metropolitan "C" improved 5. Business on Saturday was all in Gaslight "A" and Imperial Continental; both quotations standing steady. Chicagos advanced 2 each. Buenos Ayres rose ¼; and ditto debentures, 2.

ELECTRIC LIGHTING MEMORANDA.

The Danger of Fire in Electric Lighting Stations—Electricity in Mining—The Working of the City and South London Railway—Electrical Fittings on the Hire-Purchase System.

IN connection with the decision of Mr. Justice Kekewich in the Grosvenor Gallery case, which practically branded the transformer stations of the high-pressure alternating system of electrical distribution as dangerous nuisances, not to be permitted in populous neighbourhoods, it may be interesting to notice the recent occurrence in Chicago of a fire at an electric light company's generating station, which had results very similar to those of the Grosvenor Gallery catastrophe. It will be remembered that the fire at the Grosvenor Gallery station, which aroused in neighbouring residents the determination to seek the aid of the law in banishing such an establishment from their midst, was caused by a "short-circuit" at a switch. Similarly, the Chicago conflagration started with a "short-circuit" somewhere in the mains leading to the dynamos. Nobody knows what was the immediate cause of this well-known electrical phenomenon in this instance; but it is certain that the insulating material of the cables instantly ignited from the flash of the improvised arc, and as all the wires in the circuit became red hot in a moment, the wooden casings and other combustible surroundings were burnt. The fire spread along the paraffined and gum-coated wires with wonderful rapidity. The newspaper description of the occurrence says that "in an instant there was a flash, followed by a loud sputtering noise; and almost before the men at work in the room could escape, it was in flames." Stores of paraffin and cork for insulating purposes were upon the same premises; and consequently the fire was of unusual fierceness. This Company served about 3000 arc lamps in various parts of Chicago, besides supplying power for electric motors; but they did no incandescent lighting. The undertaking was therefore of considerable magnitude. The fire furnishes another significant commentary upon the claims of electricians for immunity from the ravages of what the newspapers used to call "the devouring element."

It is always pleasant to record something to the credit of electrical science, as a set-off to the vast bulk of electricians' unfulfilled prophecies; and therefore we read with much satisfaction the recently published testimony of Mr. Ernest Scott as to the efficiency of electrical appliances in mining. Mr. Scott stated before the Institution of Engineers and Shipbuilders, that already upwards of fifty mines in the United Kingdom are supplied with electrical machinery; and he claimed that by this means mines which have been commercially unworkable owing to their depth, or the great distance of the working face from the pit head, can now be turned into profitable undertakings. This is good news for all who are interested in obtaining cheap coal; for the longer the old pits can be kept going at a profit, and the easier new and deep seams can be worked for the market, the less will be the chance of good coal getting into few hands, and its production falling under the control of "rings." Let us hope that Mr. Scott's testimony in this regard is not that of one who "makes the wish the father to the thought," and that what he says can be done by electrical mining machinery is, in point of fact, actually performed. We do not question the witness's veracity, of course; but experience illustrates the necessity for caution in accepting claims on behalf of new electrical developments.

The remark with which the preceding paragraph concludes suggests mention of the fact that the working of the City and South London Railway, which is supposed to be a successful technical, if not a prosperous commercial, application of electrical locomotion, is continually giving rise to complaints. Nobody seems to know what is the matter with the Company's arrangements; but the fact remains that delays and interruptions of the train service are far too common to please the travelling public, while the manner of running of the trains is frequently such as to seriously discompose nervous passengers. Breaks-down in the tunnels between the stations are, to say the least of it, far more numerous upon this electrically-worked line than they are with ordinary railways; and passengers, who are apt to measure the extent of the risk in railway travelling by their own discomfort, are often heard to prophesy that there will be a "terrible accident" some day between the Monument and Stockwell. It is difficult to understand how this can be; for the electrical railway, even if it equals the old "atmospheric" system of railway working in its demands upon the patience of its patrons, seems to be at least as free from the ordinary hazards of steam locomotion.

A speculation entitled the "Electric Fittings Hiring and Maintenance Company, Limited," is being promoted, having for its object the creation of a hire-purchase system of fitting houses for electric lighting. There is, of course, nothing new in the fundamental idea, which is in common application among manufacturers of pianos, railway waggons, and other portable property which "comes expensive," as the popular phrase goes, to the purchaser. And it may be conceded that there is no particular reason why a system of commercial dealing which, although condemned as wasteful by purists in economy, nevertheless produces a good deal of trade, should not be applied to the wiring and fitting of houses for electric lighting. Granting this, it is a somewhat remarkable fact that the prospects of the proposed venture have not been well spoken of by anybody, least of all by the electrical journals, which might be supposed to be in sympathy with any reasonable project for removing the disabilities under which the electric lighting industry labours. Our contemporary the *Electrical Review* notices the scheme, only to remark that it does not believe the expense of fitting and wiring houses retards the adoption of electric lighting to the extent implied. There is a good deal to be said upon both sides of this question. The expense of wiring a house in which the occupier has only a temporary interest, doubtless does deter many a resident in districts served by central station companies from patronizing the latter; but we doubt whether the intervention of a hire-purchase fittings company would prove, in the majority of cases, an acceptable way out of the difficulty. In some instances, the obstacle to the introduction of electric lighting into a house may be want of funds to pay the wiring contractor's bill; but in these cases the connection might be regarded as of doubtful advantage to the supply company. On the other hand, it is easy to understand that no hire purchasing arrangement would meet the case of a gentleman of means living in a hired house. After all, experience shows that the hire-purchase system appeals only to those who are short of ready money; and it is extremely doubtful whether householders in this position would constitute eligible customers for an electric lighting undertaking. We seriously doubt whether such a speculation as the one in question could justify its existence for any lengthened period.

GAS BILLS FOR 1892.

THE following are the principal features of the Private Bills relating to gas supply which await the attention of Parliament during the coming session.

The Rhymney Valley Gas and Water Bill is for the incorporation of a Company with a capital of £50,000, whereof £20,000, with the usual proportion of borrowed money, is classified as gas capital, for the supply of portions of the parishes of Gelligaer and Llanfabon, in Glamorganshire, and the parishes of Bedwellty and Mynyddislwyn and the township of Bedwas Upper, in Monmouthshire. The incorporated Company propose to purchase the undertakings of the Bargoed and the Hengoed Gas and Water Companies, Limited. Gas of 15-candle power is to be supplied at the maximum price of 6s. per 1000 cubic feet. This is the only new statutory gas undertaking in the list for the year.

The Barry and Cadoxton Gas and Water Bill contains provisions for increasing the gas capital of the Company by £32,000, with the usual borrowing powers. The Bristol Gas Bill is to enable the Company to acquire compulsorily additional lands for storeage purposes, and to sell superfluous lands. Other ground for extraordinary purposes, not exceeding 15 acres, is to be purchased by agreement. The East Grinstead Gas and Water Bill is to enable the Company to deal in gas-fittings, to require prepayment for gas in certain instances, to limit the calculated period of error in the case of defective meters, to acquire additional lands adjoining their existing gas-works, and to apply for electric lighting powers. The Liverpool United Gaslight Company have a short Bill for the acquisition of lands and the erection of additional works for storeage purposes, and also for conferring powers on the Company to make and deal in meters, fittings, &c. The Gas-Works Clauses Act, 1871, is to be incorporated with the Act, subject to certain provisions. The Ormskirk Gas Bill is to authorize the Company, who were incorporated in 1853, and have not been in Parliament since, to extend their limits of supply, to acquire new lands, and to raise £20,000 of new capital under the usual conditions, with the customary borrowing powers. Gas of 13-candle power is proposed to be supplied; and there is no suggestion as to limitation of selling price or sliding scale. The Oxford Gas Bill is to extend the Company's limits of supply, so as to include the whole of the City, and the parish of Wolvercote. An acquisition of land by the Company is to be confirmed, and certain minor provisions of the Act of 1869 are to be amended. From and after June 30, the capital of the Company is to be reckoned as £143,892, subject to being increased under the new Act by £100,000, whereof the sum of £47,112 is to be 5 per cent. preference stook and the remainder to be a consolidated 5 per cent. ordinary stock. This stock is to be rateably apportioned among holders of the Company's existing stocks, of which it is to be the equivalent in all respects. The standard prices proposed in the Bill are 3s. 2d. and 3s. 8d. for gas consumed within and outside the City boundaries respectively. The sliding scale is asked for, with 5s. per cent. rise or fall for 1d. in the price of gas. The usual borrowing powers are asked for on the new capital; and it is also desired to borrow upon the premium capital. The Pontypool Gas and Water Bill deals wholly with the Company's water undertaking. The Southend Gas Bill is to authorize the issue of additional share capital not exceeding £45,000, to carry the usual borrowing powers, and to be entitled to a 7 per cent. dividend. The Company desire to construct a jetty and a single line of tramrails for the convenience of their works; also to acquire additional lands. The proposed standard price of gas is 4s. 6d. per 1000 cubic feet. The Stamford and St. Martin's Stamford Baron Gas Bill is to repeal an Act of George the Fourth which incorporated a local Company with a share capital of £5625. Prior to the year 1827, this capital was increased, by contributions from the original shareholders, to £11,250; and since this period upwards of £10,000, derived from the divisible profits, has been similarly expended upon the works and undertaking of the Company. The district of supply has also grown; and, according to a recent valuation, the works and undertaking, together with the working capital, are worth £22,000. The net earnings of the Company for the last ten years have averaged £1500 per annum; and they are not restricted as to price or quality of gas. The Bill contemplates an extension of the limits of supply, and fixes the capital of the Company at £30,250, whereof all but £10,000 is to be styled original capital; and both classes of capital are to carry a 7 per cent. dividend. The proposed price of 15-candle gas is 4s. per 1000 cubic feet, with the sliding scale after the usual rate.

The Cleator Union Local Board Gas Bill is to authorize the transfer of the local Gas Company's undertaking to the Board, in accordance with the terms of a scheduled agreement, whereby the Company arrange to sell their property for £16,000, besides stock in trade. It is stipulated that on the day of transfer "the Company shall have in their gasholder 45,000 cubic feet of gas of at least equal quality as [*sic*] that now supplied by them." The total share capital of the Company is £12,500, all paid up; and they have no mortgage debt. The Local Board desire to borrow, for the purposes of the Act, £14,000, in addition to the sum which will become payable to the Company. The maximum price of gas is to be 4s. 7d. per 1000 cubic feet, and its illuminating power 15 candles. Provision is made for the sale of a portion of the undertaking to the Arlecdon and Frizington Local Board. The Ilkley Local Board Bill contains provisions to enable the Board to purchase the undertaking of the Ilkley Gas Company. The gas limits are to be extended so as to comprise the parish or township of Denton, in the West Riding of York. It is proposed that, any time within three years after the passing of the Act, the Board may serve the Company with notice to sell their undertaking for such price as may be agreed upon or determined by arbitration. Power is desired to deal in fittings and to make a communication between the gas-works and the Midland Railway; also to borrow such money as may be required for purchasing the undertaking. The Southborough Local Board (Gas) Bill is to empower the Urban Sanitary Authority for the district of Southborough, in Kent, to acquire the undertaking of the local Gas Company, incorporated by Provisional Order in 1891, whose works are declared to be ill-adapted and badly situated to meet the present and increasing demand for gas within the district. Power is to be taken to sell portions of the undertaking to other sanitary authorities, to supply neighbouring sanitary authorities with gas in bulk, and to agree with the Tunbridge Wells Gas Company for acquiring the rights of the Company within the district of the Local Board. The price to be charged to consumers for gas is not to exceed 4s. 8d. per 1000 cubic feet. A sum not exceeding £30,000 is to be borrowed for the purpose of carrying out the Local Board's scheme.

The Sutton Coldfield Corporation Electricity and Gas Bill occupies a class by itself. It contemplates the purchase by the Corporation of the undertaking of the local Gas Company, and also a portion of the Birmingham Corporation gas undertaking, together with the establishment of an electric lighting undertaking. An agreement for the sale and purchase of the gas undertaking has been arrived at between the Company and the Corporation, and is scheduled in the Bill. The price agreed on between the parties is £7000, besides the value of the stock-in-trade; and there are to be 80,000 cubic feet of gas in the holders on the day of transfer. Terms of purchase are to be agreed upon, or settled in the usual way, for the transfer to the Corporation of the local portion of the undertaking of the Birmingham Gas Department. The maximum price of gas is to be 4s. 6d. per 1000 cubic feet, and its illuminating power 16 candles. The electric lighting powers desired by the Corporation are of the usual character; and the sum of £10,000 is the total named as the capital required for this purpose. In addition to the purchase-moneys, a sum of £30,000 is to be borrowed for gas-works purposes.

The Swinton and Pendlebury Local Board Bill provides for the purchase of a portion of the gas undertaking of the Salford Corporation, in accordance with and subject to the provisions of the Act of 1891. Particulars of the mode of valuation are given. Power is required for the acquisition of lands and the erection of gas-works. The maximum price of gas to be charged by the Local Board is to be 4s. per 1000 cubic feet, and the illuminating power is fixed at 14 candles. The sum of £100,000 is to be borrowed for the construction of gas-works, and so much more as may be required for the purchase of the undertaking and the settlement of the scheme.

The Blackburn Corporation Bill contains a proviso for the application of section 47 of the Gas-Works Clauses Act, 1847, and section 18 of the Gas-Works Clauses Act, 1871, to meters and fittings belonging to the Corporation, "notwithstanding that such meters or fittings, as the case may be, shall not have been let for hire or for remuneration in money." The gas limits are also to be extended to include the township of Billington. The Blackpool Improvement Bill includes a clause providing for the acquisition of the portion of the undertaking of the St. Anne's-on-the-Sea Gas Company situated within the borough. The Leeds Corporation (Consolidation and Improvement) Bill is an *omnibus* measure for dealing with all the multifarious statutes under which the borough is administered. Part 8 is devoted to gas, and is to re-enact the general powers of the Corporation in respect of gas supply. The limits are defined; but outlying portions of the undertaking are to be saleable to local authorities interested. Gas of 18-candle power is to be supplied at the maximum price of 3s. 9d. per 1000 cubic feet. Rebates not exceeding 20 per cent. are to be allowable to gas consumers. Gas is to be tested at the instance of any five consumers. A new clause is proposed for authorizing the Corporation to inspect gas-fittings in new buildings before giving a supply. Contravention of the Act is to be visited by cutting off the gas. The sum of £250,000 is to be borrowed for gas-works purposes; and permission is sought to establish a gas depreciation fund. The London County Council (Subways) Bill is to compel owners of pipes, &c., usually laid underground to make use of street subways where such exist, and to pay rent for the same. The Middlesbrough Corporation Bill is to enable the Corporation to enlarge their gas-works and make a new street in connection therewith. All expenditure upon gas-stoves, &c., is to be ratified. New lands are to be acquired for gas purposes; and the sum of £50,000 is to be borrowed for the same. The Newcastle-upon-Tyne Improvement Bill contains a clause under which the Newcastle-upon-Tyne Corporation and the Gas Company are to be empowered to enter into and fulfil agreements with regard to the testing of gas at places other than the Company's works.

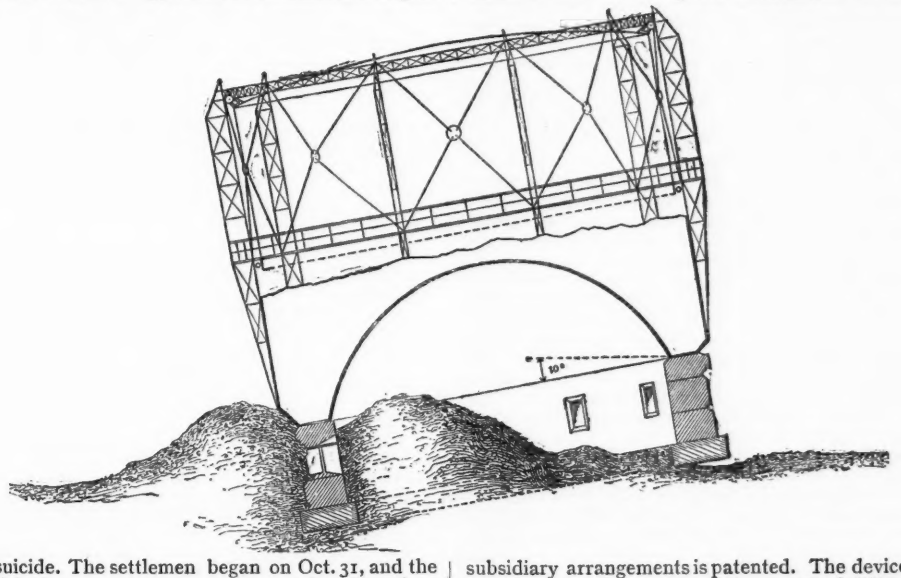
NOTES.

The Foggiest Months of the Year.

The statistics collected by the Royal Meteorological Society confirm the experience of gas managers upon the point of December being the foggiest month of the year. The popular notion is that November is the month of fogs; but this general impression is not supported by the figures. According to a paper recently read before the Society by Mr. F. J. Brodie, upon the prevalence of fog in London during the twenty years 1871 to 1890 inclusive, it appears that the number of fogs in November is, if anything, slightly less than in October or January, and decidedly less than in December, which month has the worst climate of the whole year. Moreover, the latter part of the winter is not only less foggy than the earlier part, but is noticeably clearer than the autumn months. In February, so far as the records of the past twenty years show, the average number of days with fog is only 6·6, as against 8·9 in January, 10·2 in December, 9·2 in October, and 8·8 in November. Thus it appears that one-third of the month of December is foggy, on the average. The effect of the general lighting up of house fires in October is very noteworthy. This is not the first time, either, that statistics have contradicted the popular notion of the badness of the weather of the month of February, which usually shares public reprobation with November on this score.

A Gasholder Catastrophe.

The accompanying illustration, which is reproduced from the *Journal für Gasbeleuchtung*, represents the settlement, as it appeared in November last, of a gasholder erected at Constance in the course of the previous year. The drawing explains itself; but it was reported in our German contemporary that the tank sank in consequence of the bad subsoil and an insufficient foundation. The occurrence so wrought upon the nervous temperament of the Engineer (Herr August Raupp), that in a moment of despair



he committed suicide. The settlemen began on Oct. 31, and the sketch from which the engraving was made was taken three days later. It is noteworthy that the concrete ring of the substructure settled without showing any other failure than a crack in the sill of the door giving access to the vault under the tank. The whole structure went together so gently that not a pane of glass in any of the ten vault windows was cracked. The settlement of the foundation squeezed up the earth as shown. The diameter of the tank was 24 metres; and the foundations were 3 metres in height, of which the concrete measured 1 metre in thickness, and the rest was a sandstone wall. The tank was 15 metres deep. The water weighed 1770 tonnes; the ironwork, 140 tonnes; and the masonry, 673 tonnes. The total weight upon the subsoil was 2583 tonnes, distributed so as to throw a pressure of 18 tonnes per square metre upon the ground covered by the concrete. The subsoil is first loam, underneath which is alluvial mud, plainly in communication with the water of the Bodensee; so that a yielding slush is formed, which was the occasion of the catastrophe. At first the tank settled equally, and maintained a fair level; but eventually it lunged over quite suddenly in the position shown.

Another Fuel-Gas Process.

Another fuel-gas process, the invention of Dr. Alphonse Hennin, has been developed in Illinois, according to a report in the *Iron Age;* the product being described as containing 60 per cent. of combustible matter, and at the same time yielding larger quantities of ammonia and tar than have ever before been secured by any process. The Springfield Iron Company have now in operation two large producers 10 feet in diameter upon Dr. Hennin's system, and are building three more of the same size. The plant, when completed, is expected to make from 5 to 6 million cubic feet of the gas per day. The producers appear to be of the ordinary description; being cylinders made of wrought iron, and lined with fire-brick. The fuel is fed into a hopper at the top of the producer; and the bed of fire is supported on a grate at the bottom. The combustion is maintained by blasts of steam and air, which are introduced radially through tuyeres just above the grate. The novelty of the invention is described as consisting in the regulation of the relative proportions of steam and air so as to maintain in the lower part of the producer an incandescent zone or bed of fuel, at a sufficient temperature to decompose practically all the steam admitted, and at the same time so regulating the supply of fresh fuel that the upper portion of the producer is kept at a temperature low enough to allow of the formation of ammonia, and prevent its decomposition.

Altering the Pressure of Gasholders.

Mr. George T. Thompson, of the Laclede Gas-Works, St. Louis, has invented a device for enabling the pressure exerted by a gasholder to be increased or diminished at will, without loss of time, and in a simple, convenient, and economical manner, whether or not the holder is provided with guide-framing. He effects his object by forming an annular gas and water tight box, which is attached to, or forms part of, the gas-holder, to which it stands in the relation of an additional internal bottom box-curb. There may be another of these boxes near the top of the holder. The interior of the box communicates with the gas-containing portion of the holder by means of a vertical pipe rising higher than the water-line; and there is a valve communicating with the water in the tank. There is a flexible tubular attachment connecting the interior of the box with a pump outside the holder. All necessary connections and valves are provided to enable the internal box to be filled with water or emptied at will—thus altering the buoyancy of the holder; and the complete combination of the box with the subsidiary arrangements is patented. The device is an ingenious attempt to deal with one of the practical difficulties of working the large holders required in modern gas-works, which rarely give pressure enough when working as single-lifts.

Society of Engineers.—The first ordinary meeting of this Society for the present year will be held at the Town Hall, Westminster, next Monday evening, when the Past-President (Mr. W. N. Colam) will present the premiums awarded for certain of the papers read during last session, and the new President (Mr. J. W. Wilson, jun.) will deliver his Inaugural Address.

Incorporated Institution of Gas Engineers.—The Secretary of this Institution (Mr. Thomas Cole) has issued a circular to the members, under date of the 20th inst., giving notice that the annual general meeting will be held at the Offices, 11, Victoria Street, Westminster, on Saturday of next week, the 6th prox., to transact the following business: "Election of Scrutineers; to receive report of Scrutineers; election of President, Vice President, and Members of Council; election of members; report of the Council and statement of accounts; reading of communications and papers; and other business." An intimation accompanies the notice to the effect that only formal business will be transacted at the meeting; and that after disposing of the first four items on the *agenda*—that is, after the election of officers and members—it is proposed to adjourn the further proceedings until May 11 and 12, for which occasion the Institution of Civil Engineers have granted the use of their hall in Great George Street, Westminster. Mr. Charles Hunt, of Birmingham, has been nominated for President, and Mr. John Methven for Vice-President.

COMMUNICATED ARTICLE.

LIGHTING.

By W. H. Y. Webber.

PART III.—A CRITICAL EXAMINATION OF MODERN PRACTICE.

(*Continued from p.* 109.)

Out of London, the palm for brilliant street lighting would probably be awarded to Belfast. The case of Birmingham is not overlooked in making this statement; but is to be borne in mind that the Birmingham example, like that of Hyde Park Corner, is of a decorative cast, and is concentrated upon a particular area. The Belfast lighting is street lighting pure and simple; and nowhere has the advantage of municipal control of the gas undertaking been more strikingly illustrated in this manner. It is instructive to notice that in Belfast, as elsewhere, it was the electric arc lamp that convinced the Local Authority of the insufficiency of the gas lighting in common use. Mr. James Stelfox, the Engineer and Manager of the Corporation Gas-Works, informs the writer that the improvement of the street lighting of Belfast was brought about as follows: Some years ago, certain electric companies began to talk of lighting one of the principal thoroughfares of the city at so much per lamp per hour. It occurred to Mr. Stelfox that this was a very specious way of putting the proposal before the public, who had only the small hourly charge before them, and were therefore induced to ignore the gross yearly charge, to arrive at which required an effort in multiplication. He therefore, through the then Chairman of the Gas Committee (Sir John Savage), obtained permission to light Donegall Place, which is about 220 yards long, with gas upon the same basis of charge. It had been computed that six arc lamps would be required for the lighting of this line of thoroughfare, at a cost of 3d. per lamp per hour, or 1s. 6d. per hour for the whole. For the same money, Mr. Stelfox arranged to put in twenty 80-candle gas-lamps, with two 200-candle lamps at the end of the Place. This was done to show what could be effected at a profit by the Corporation Gas Department for the price asked by the electric light companies. As might be supposed, this special favour to Donegall Place created heart-burnings in the citizens whose interest lay in other thoroughfares. Thanks, however, to the public spirit of the Corporation, and the pertinacity of Mr. Stelfox, the improved lighting was in time extended. Owing to the length of the thoroughfares involved in the system, as at present exhibited nightly in this flourishing town, it is impracticable to give a plan of them. It is therefore necessary to rely upon letterpress description. The first line of lighting connects the two principal railway stations, and traces the main artery of traffic. The second branches from the first to the quays.

The first section of the first line commences at the Belfast and Northern Counties Railway Station; and proceeds along York Street to Donegall Street, being 1190 yards long, and exhibiting sixty-one 100-candle Bray lamps; the spacing therefore averaging about 40 yards on each side of the street. The lamp-columns are 14 ft. 6 in. high; so that the light is shown at a height of about 15 ft. 6 in. above the level of the street. Next comes a section consisting of the first portion of Royal Avenue, which has sixteen 80-candle lamps, with four 200-candle lamps at the corners next Donegall Street and North Street. The lamps average 18¼ yards apart on each side of the street. The second section of Royal Avenue, from North Street to Castle Place, contains thirty-one 100-candle lamps at intervals of about 24 yards on each side of the street. In the centre of the crossing at Castle Place there is a large lamp of 400-candle power for the illumination of the Square. Donegall Place, as already remarked, has twenty-one 80-candle lamps, spaced 20 yards apart, with two 200-candle lamps additional at the crossings next the White Linen Hall. All these lamps are on tall posts, showing the light 15 ft. 6 in. from the gronnd. Two independent main routes from Donegall Place to the Great Northern Railway Station are lit with 100-candle lamps on 10 feet posts, at 40 yards intervals. From the central junction at Castle Place, and also from the junction of Royal Avenue and Donegall Street, other lines of lighting extend to the Quays and across the river to the County Down and Holywood and Bangor Railway Stations. The direct route from Castle Place to the station is 1250 yards in length, and this is lit by eighty-five 100-candle lamps, with one 200-candle lamp at the junction with Donegall Quay; the average spacing of the lamps being thus 30 yards on each side of the thoroughfare. The area in front of the Custom House is lit by seventeen 100-candle lamps on ordinary posts, and two 200-candle lamps. Along the Donegall Quay there are sixteen 100-candle lamps on tall columns, 20 yards apart. All this splendid street and quay lighting is continuous. Extending from the points at which the high-power lighting ends, the ordinary street lanterns are provided with 8 feet burners for some little distance, so as to diminish the effect of the break; and at many of the ordinary street crossings there are 200-candle lamps, and a few of still higher power.

The lighting upon the higher scale is not kept up after midnight. It should be explained that the use of 80 and 100 candle lamps upon ordinary 10 feet posts is only done to utilize the latter, and avoid the expense of all new lofty posts; but it is acknowledged that the latter are preferable for such high powers in streets. For a specimen of a gas-lit thoroughfare, Belfast can undoubtedly compete with any town in the world.

The lighting of the Brighton Esplanade by high-power "Whitehall" lamps is generally admired. The extent of the sea-front at Brighton lighted in this way by gas is 4000 yards, and reaches from West Brighton to Black Rock. The system comprises 157 "Whitehall" lamps, which burn at the rate of 5 cubic feet per hour for the first half hour of lighting; then they increase to 30 feet, or (say) 100 candle power, until 11 p.m.; after which they are again reduced to 5 cubic feet per hour for the rest of the night. In addition to these, there are 23 lamps burning a maximum of 15 cubic feet per hour. The average height of all the lamp-posts is 9 feet.

Some of the comparatively poor parish Vestries of the South of London, who have no "promenades," or "esplanades" to light, but are nevertheless compelled to provide for considerable heavy traffic along the main lines of communication, prefer to use 10-feet burners in "Balham" lanterns, which are ventilated through the top; thus assisting the steady burning of the flame. These lamps are exhibited upon ordinary posts, at distances of 30 to 40 yards. Street crossings are commonly lighted with lamps of 100 or 200-candle power on lofty columns.

Very recently, what is considered to be the best display of electric arc lighting yet seen has been started in Queen Victoria Street, City. It ought to be good, for it represents the practical outcome of some seven or eight years' planning, and some highly elaborate financial arrangements. The light is that of ordinary Brush lamps of 12 ampères, credited with 2000-candle power nominal, which means perhaps 1000-horse power maximum for the naked arc. These are exhibited at about 18 feet above the ground, in polygonal pyramidal lanterns, glazed with waved, etched, or crinkled glass, in order to break up the light without so much loss as is caused by the heavy opal glass in common use. The difficulty in this case is that glass which is sufficiently faceted to break up the rays of the arc also holds much dirt; so that, taking the practical impossibility of thorough cleaning into account, this style of glazing does not gain much upon the opal. The lamp-posts are, on an average, 50 yards apart.

From the foregoing examples, the student can draw conclusions as to what is held to constitute good street lighting in the United Kingdom at the present day.

(*To be continued.*)

The Wenham Lamp Patents.—We understand that the Wenham Company, Limited, have instituted proceedings against the Thomas Lighting Company, Limited, and also against the Lamp Manufacturing Company, Limited (Fullford's Lamp), for alleged infringement of Frank William Clark's patent of the 1st of July, 1881, No. 2869.

Institution of Mechanical Engineers.—The annual general meeting of this Institution will be held on the 4th and 5th prox., the President, Mr. Joseph Tomlinson, in the chair. On the first day, the annual report of the Council will be presented; and the annual election of the President, Vice-Presidents, and Members of Council will take place. There will be two papers read and discussed, one of which is entitled "Notes on Mechanical Features of the Liverpool Water-Works, and on the Supply of Power by Pressure from the Public Mains and by Other Means," by Mr. Joseph Parry.

The Liberty and Property Defence League, whose labours in maintaining freedom of contract, upholding proprietary rights, and resisting Socialistic legislation, we have had frequent occasion to notice with approval, have issued a report on their work during the past session. Two of the Bills to which the attention of the League was specially directed were the London Water (Meter) Bill and the Metropolitan Water Companies' Charges Bill. The Parliamentary Committee of the League objected to the former measure on the ground that the rights of the Water Companies, granted and confirmed by seventy different Acts of Parliament, were invaded, and because it would have an unsanitary effect in the poor quarters by restricting the free use of water. On representations from the associated Metropolitan Water Companies, the Committee took steps to assist in opposing the Bill. By the help of two members of the House of Commons, notices of motion for the rejection of the Bill were placed on the paper; and 2000 requests for opposition and objections were sent to members of Parliament, the Press, and societies federated with the League. The Bill was opposed on the second reading—the debate standing adjourned; and, as our readers are aware, it was subsequently dropped. As to the Charges Bill (which was to prevent any Metropolitan Water Company from increasing the water-rate on a tenement beyond the amount demanded in the previous financial year, except where there was a larger use of water, where the cost of supplying the water had increased, or where the occupier had contracted in writing to pay the increased rate), the Committee, objected to it on the ground that it proposed to change the bases of charge for water fixed by previous Acts, upon the faith of which the capital of the Companies had been subscribed; and also because, owing to variations in rateable value, the Companies might be compelled to lower a charge, but were prevented from raising it. On representations from the Companies the Committee took steps to assist in opposing the Bill at the proper stage; and it was opposed on the second reading. At the suggestion of the Government, however, it was referred to the Select Committee on the other Water Bills, who reported it; but it was not proceeded with further.

TECHNICAL RECORD.

COMPARATIVE PHOTOMETRIC TESTS OF LARGE GAS BURNERS AND LANTERNS FOR PUBLIC LIGHTING.

At the last Meeting of the German Association of Gas and Water Engineers, a paper on the above subject was read by Dr. N. H. Schilling, of Munich. A translation was in contemplation for our columns; but as one has already been made for the *American Gaslight Journal* by Mr. C. S. Davis, we reproduce it. A portion of the paper, dealing with the effect of mixing air with gas, was referred to in a "Note" in the JOURNAL for the 12th inst.; but the entire communication will be of interest in connection with the series of articles on "Lighting" which are now appearing in our pages.

In addressing you on this subject, I must recall to your minds the fact that it is one which has been many times discussed, and very ably so. But I thought it might prove instructive and interesting, in view of the photometric tests made by Inspector Ries and myself last year, on the one hand to complete those tests as far as might be necessary for an exact comparison of the more important regenerative lamps on a basis of separate tests, and a certain number of street lamps; and, on the other, to experimentally verify the method itself of testing. There is often very little difference between the luminous powers of several styles of lamps. Hence it seemed fitting to make the method of testing so exact that parallel tests made with the same lamp should show only the least possible differences.

In photometric tests of luminous sources of considerable intensity, an intermediate or comparative source of light is always necessary, for reference to the standard on the one side and to the luminous source to be measured on the other. This double measure entails the liability of double error in reading, as is well known. The errors in reading made in measuring the lamp with the standard burner easily amount, even when the test is made with the greatest care, to 4 per cent.—that is to say, to 0·04 of error for a reading of 1. In regulating the standard burner to a luminous unit, the mistakes made may, without any exaggeration, be estimated at 2 per cent. Then, again, by taking account of the errors made in reading the gas-meters, occasioned by the variations in the light unit employed, &c., there may be readily committed, for one single lamp, a total error of 6 per cent., which, for a lamp having a lighting power of 70 candles, would be equal to 4·2 candles. But, in reality, far more important mistakes are frequently made in parallel tests, for the lamps themselves are subject to grave variations; whereas the hypothesis is always made that the gas, on its part, has a luminous intensity absolutely constant. But as this is never the case, it has been proposed to employ, as a unit to which the standard burner may be referred, not only the light unit itself, but the normal Elster Argand burner, fed with the very same gas as the lamp to be tested. For it is freely admitted that a variation in the lighting power of gas does not change the ratio existing between the lamp and the normal Argand burner. It has seemed best to us to experimentally limit this hypothesis.

We have mixed with the gas different fixed quantities of air, in order to lower the quality, and then fed each of these mixtures, in one case to a regenerative lamp, and in another to a slit-burner lamp. The following table gives the photometric results obtained:—

Air Added in 100 Parts of Gas.	Luminosity of the Slit-Burner Lamp.		Luminosity of the Regenerative Lamp.	
	In Hefner-Alteneck Light-Units.	In 100 Parts of Luminosity for an Addition of—	In Hefner-Alteneck Light-Units.	In 100 Parts of Luminosity for an Addition of—
0	18·97	100·0	70·06	100·0
2	16·22	85·5	58·35	83·3
4	13·88	73·2	51·96	74·2
6	11·85	62·4	45·29	64·7
8	9·82	51·8	36·57	52·2

We find from this table that the diminution in the percentage of the two burners, in proportion to the increasing quantity of the air intermixed, is almost the same. The mistakes are in the limits of the errors of observation.

The conditions under which another test was conducted are different. A regenerative lamp was measured by means of the Elster angular photometer, with an Argand burner as the standard of comparison. Furthermore, the same gas which supplied both burners was mixed with air, but always in exact quantities. Designating the lamp by L, and the standard burner by a, the ratio $\frac{L}{a}$ for the mixtures of air below has been:

0·0 per cent.	20·9
2·3 ,,	20·5
3·1 ,,	20·5
6·8 ,,	26·0
12·9 ,,	30·7

It follows from these figures that the two lamps were in a fixed ratio to each other until the air supply had exceeded 3·1 per cent. As may be foreseen, an even greater addition of air would not affect the ratio if it were not that the flame of the standard burner, whose consumption was only 1·90709 cubic feet, in consequence of the increase of air, burned with such feeble power that combustion could not take place under constant normal conditions. For the limits within which gas ordinarily varies, we may consider the exactness of our hypothesis as proved, by virtue of which all burners vary proportionally—that is to say, the ratios of the slit burner, the Argand burner, and the regenerative burner remain constant so long as these appliances are fed with the same gas.

The figures below show that the luminous intensity of an Argand burner, burning with a very small flame, diminishes very much more rapidly in case of an important fault in the consumption than when this intensity is calculated proportionately to the diminution of consumption. The standard Elster burner has given, for a consumption of 1·91769 cubic feet, 2·22 candles; of 1·61396 cubic feet, 1·32 candles; and of 1·31377 cubic feet, 0·54 candles. Instead of which the calculation in proportion to the diminution of consumption gives, for the consumption of 1·91769 cubic feet, 2·22 candles; of 1·61396 cubic feet, 1·87 candles; and of 1·31377 cubic feet, 1·52 candles. This surely tends to prove that, for such small flames, the chilling produced by the diffusion of air in combustion is very considerable, with the result that a normal development of constant light is no longer obtained.

A series of photometric observations has been made of such a kind that, both before and after each test of the lamp at the various angles, the standard burner has been regulated by the normal Argand burner, fed with the same gas. But it has even then, naturally enough, produced such differences that the standard burner gave higher values before than after the test. It was not shown that this variation was occasioned by the vitiation of the air and by the rising of the temperature in the chamber of the photometer; but this supposition has been confirmed by a test carried on for a period of two hours with the chamber of the photometer completely closed. The following table gives the results obtained:—

Time.	Ratio between the Normal Argand Burner and the Standard Burner.	Temperature of the Photometric Chamber.
4 h. 00 m.	Moment of lighting.	15·6°
4 h. 35 m.	7·071	17·0°
5 h. 15 m.	7·127	19·0°
6 h. 00 m.	7·371	19·0°
6 h. 10 m.	7·525	19·5°

When it was a matter of comparing different lamps with each other, in the first place in regard to the relative luminous intensity existing between them, and in a less degree in regard to their absolute luminous intensity, we have modified the method of testing as follows: Neglecting to regulate every time the standard burner by the normal Argand burner, we have taken the former as unity, and referred the other lamps to that alone. It was adjusted once precisely and exactly by means of the Hefner-Alteneck lamp, and has given an absolutely constant light, with uniform consumption. The consumption has been fixed at 1·907 cubic feet for all the experiments, and kept fixed during the continuance of the tests.

Experience has taught that it is of value for this purpose not to use regulators, for they are not perfectly reliable and exact. The consumption has been adjusted as accurately as possible by hand with a micrometric screw, and tested every minute; and, in the calculation, account has been taken of slight errors—on an average about 54.

In order to refer all the tests to a gas of fixed luminous intensity, we have adopted as normal gas that which, at a rate of consumption of 3·53 cubic feet in a slit burner, should have a luminous intensity of ten Hefner-Alteneck lamps. However arbitrary this hypothesis may be, we may freely modify, to suit any other kind of gas, the results actually obtained with this gas, which should be regarded as normal.

The different principles applied in each city in testing gas are, perhaps, the fertile causes by reason of which the photometric tests made with large gas-burners and with different gases so often present such important variations. It is therefore highly to be recommended that all tests intended to determine the value of certain lamps, as in the actual case, should be referred to a "normal gas" precisely defined. It is for this purpose that we have re-tested in these trials those lamps which we previously examined, and which we have classified one by one. The luminosity obtained, in referring it to this normal gas, for the standard burner by several tests, with a very considerable degree of agreement, has been as follows:—

1st test	3·42	after 10	readings.
2nd ,,	3·45	,, 20	,,
3rd ,,	3·41	,, 10	,,
4th ,,	3·45	,, 10	,,
5th ,,	3·39	,, 10	,,
Average	3·42	Hefner-Alteneck light-units.	

By this method errors have been, as far as possible, obviated; and many parallel tests have been made rapidly one after another. The trials, always conducted by two experimenters, have been made with every requisite precaution and care. I ought specially to mention that only those lamps having an approximately similar consumption of 10·595 feet have been compared.

The lamps that have been tested are: (1) Regenerative lamps: The Wenham, the Bandsept, the Stern, Siemens's reversible, the Westphalia, the Sylvia, and Siemens's flat burner. (2) Street lanterns: The Munich lamp with single-slit burner; a lamp with two adjoining slit burners; a lamp with Zwillings's burner; Krause's large burner lamp; the Munich large burner lamp; the Schülke large burner lamp.

It has appeared necessary to determine for the lamps the consumption in developing, by means of a known quantity of the gas (for example 3·53 cubic feet), the most favourable light effect. Consequently, each lamp has been measured, with a different consumption, at one and the same angle of 50°; and this luminosity referred to 3·53 cubic feet of gas. For each lamp a flame of fixed size may be taken as normal. If the effectiveness of the lamp were the same for every consumption, 3·53 cubic feet of gas ought always to furnish the same luminous intensity, whatever the effective consumption by the lamp. But experience has shown that the effectiveness varies greatly—following the height of the flame, and notably so in reversible lamps. This effectiveness is generally less with an inconsiderable flame, and is greater in proportion to the increase of the flame. From this we may see how important it is to make regenerative lamps burn as much as possible with full flames; and this care ought especially to be exercised over reversible lamps. For example, the luminosity, given in Hefner-Alteneck light-units, of the Siemens lamp with different effective consumptions, is—

Normal Consumption of—	Reduced to a Consumption of 3·53 Cubic Feet.
10·17115 cubic feet	21·8
9·64140 ,,	17·2
8·72381 ,,	13·6

The amount of light obtained with 3·53 cubic feet of gas has then diminished 30 per cent. for a diminution of 1·377 cubic feet below the normal consumption. Taking as a basis these preliminary experiments, all the lamps have been studied with as great a consumption as possible, but under such conditions that the lamp burns with a flame practically of normal size, but without producing black smoke. Each lamp has undergone at least three similar tests, whose average value, especially with the larger angles, has diverged but slightly from those obtained in each particular test, as the following examples will show:—

	35 deg.	40 deg.	50 deg.	60 deg.	70 deg.	80 deg.	90 deg.
Test No. 1	61·0	67·5	70·4	71·9	73·6	73·2	72·9
Test No. 2	64·4	69·6	72·4	74·2	74·6	74·1	72·9
Test No. 3	65·5	67·8	70·2	75·2	74·6	74·4	72·9
Average	63·6	68·3	71·0	73·8	73·3	73·9	72·8
Maximum difference above	2·9	1·9	2·0	2·0	0·5	0·8	
Maximum difference below	3·2	1·1	1·1	2·6	0·9	0·9	

Luminous Intensity in Hefner-Alteneck Light-Units Developed by 3·53 Cubic Feet of Gas burned in the Lamps and Lanterns Named.

	0 deg.	35 deg.	40 deg.	50 deg.	60 deg.	70 deg.	80 deg.	90 deg.
Wenham lamp	14·0	19·3	19·9	20·9	21·4	22·4	22·5	22·8
Bandsept lamp	16·9	18·3	18.9	19·9	20·3	21·2	21·7	21·4
Stern lamp	15·8	18·9	18·7	18·2	18·6	18·4	17·4	18·4
Siemens reversible lamp	15·9	17·4	18·1	19·5	19·8	20·3	19·7	19·6
Westphalia lamp	14·4	17·2	18·5	19·2	19·8	20·2	20·0	19·7
Sylvia lamp	12·9	17·2	18·0	18·9	19·5	19·6	19·3	19·0
Siemens flat burner	13·2	22·2	23·8	25·8	27·4	28·0	28·1	28·5
Schülke street lamp	—	18·7	16·4	16·4	14·8	12·8	10·7	
Krause large-burner lamp	—	11·2	11·3	11·3	10·7	7·7	2·8	
The Munich large-burner lamp	—	9·9	10·0	10·7	12·2	7·9	2·9	
Lamp with Zwilling's burner	—	10·0	10·0	9·3	—	8·0	—	
Lamp with two slit burners	—	9·6	9·6	8·6	—	8·2	6·9	
Slit burner with free combustion	10·0	—	—	—	—	—	—	

The agreement obtained in each separate test is as perfect as is possible with that method taken as a basis; and it should be regarded as absolutely all that is required for the object here sought.

The results given in the above table allow an immediate comparison with one another as well as with the slit burner. By fixing the luminous intensity of the latter for a consumption of 3·53 cubic feet at 1, we get, moving the decimal point one place to the left for all the numbers, those which show how many times the gas is better utilized in that lamp to which each number refers than in the slit burner. The table below shows, for example, the degree of utilization obtained, at an angle of 50°, in the regenerative lamps tested:—

Horizontal burner with slit tip	1·00
Wenham lamp	2·09
Bandsept lamp	1·99
Stern lamp	1·82
Siemens's reversible lamp	1·95
Westphalia lamp	1·92
Sylvia lamp	1·89
Siemens's flat burner	2·58

It results from these figures that, with the exception of the Siemens flat burner, all the lamps furnish almost the same mean effectiveness. In round numbers, the effectiveness of all these lamps is double that of the slit burner. The differences for the regenerative lamps taken separately are extremely small. Only the flat Siemens burner has given values showing a distinction at all marked. It is, in general, to be remarked that those lamps in which the flames burn from the outside to the inside in a circle around a reflecting cylinder, give a light much whiter than the others. The reflecting cylinders and the curving of the flame which they effect have in each light an action analogous to that of those parts called *rondelles de combustion* in the Argand burners or in oil-lamps, for they produce in the interior a mixture of gas and air for combustion.

To judge of the value of different regenerative lamps, it is necessary primarily to take into consideration the practical efficiency of the lamp, its cost, &c., since the utilization of the gas, with the exception of the flat burner, makes no essential differences. When a value is to be set on a light of whitish colour, the preference must be given to the reversible lamps. The brilliant whiteness of the light often gives novices an illusion of its very great clearness; and for this reason they often wrongfully accord it the preference.

As to the subject of street lamps, all the large gas-burner lights spoken of above might easily be employed in public lamps. But they all present the inconvenient feature of developing the highest luminous intensity at 90° more or less (but always somewhere about this angle), with the result of shedding the greater part of their light on a point already superabundantly illuminated—that is to say, the foot of the lamp-post. The Schülke lamp, while the utilization of the gas is as thorough as in the others, does not have this inconvenience, but projects its luminous intensity in a horizontal plane. It gives uniformly a distribution of light more suitable for lighting streets than those large burner lamps properly so called.

In the other street lanterns, the utilization of gas is less satisfactory. In order that a public lamp may be employed under favourable conditions, it is necessary to have, in addition to a perfect combustion of gas, a simple method of fixing, by which means the light may be readily accessible. More stress should be attached to the latter condition than to the former, for it is usually preferable to give up a previous thorough heating of the gas, provided that the workings of the light shall be the simplest possible. It is originally to this idea that the Munich lamp owes its existence.

The employment of apparatus with increasingly strong lighting power for public uses is constantly becoming more extensive; and it is absolutely incontestable that they are getting to be indispensable for the illumination of broad streets and large areas. It is to be hoped that the gas industry will succeed in producing uniformly throughout this domain such appliances as shall, whether by the principle of pre-heating or some other, solve the existing problem by obtaining a source of light of powerful intensity in the most simple form, and one in which also the gas may be utilized advantageously.

Mr. A. C. Townsend, of the Birmingham Corporation Gas Offices, was last Saturday week presented with a handsome set of bronzes by his colleagues, as a mark of esteem, on the occasion of his leaving after fourteen years' service.

New Coal-Field in Staffordshire.—According to the *Daily News*, an important discovery of two new coal-fields is reported near Newcastle-under-Lyme. The area is 200 acres. The yield is estimated at 13¾ million tons of coal, or equal to an output of 1000 tons per day for the next 45 years.

John Wilkes, Sons, and Mapplebeck, Limited.—In another part of the JOURNAL will be found the prospectus of the above-named Company, which has been formed with a nominal capital of £250,000, in £5 shares, to acquire the business of Messrs. John Wilkes and Sons and Messrs. John Wilkes, Mapplebeck, and Co., of Birmingham. The trades carried on by these firms are those of metal rollers, copper smelters, refiners, manufacturers of brass and copper, sheets, tubes, wire, &c. The undertakings have been converted into a limited liability Company for family reasons, consequent upon the death of Mr. John Wilkes; and both concerns are taken over as from the 1st inst. The purchase-money is £285,500, made up as follows: Works, £103,700; stock-in-trade, &c., £115,463; goodwill, £66,337. The whole of this has been paid to the vendors in debentures and shares. The stock now offered to the public comprises, as will be seen, ordinary and preference shares and debentures, applications for which will have to be sent in by the 29th inst.

FUEL GAS: ITS PRODUCTION AND DISTRIBUTION.

A Paper read by Mr. Arthur Kitson before the Franklin Institute.

(*Continued from p.* 113.)

We are now in a position to understand the advantage of using steam mixed with the air, and see how it is made available. Steam enables us to lower the furnace temperature, and consequently reduce the sensible heat of the gases, at the same time conserving the thermal energy for future use. By injecting a mixture of steam and air, we require less air than where it is used alone, since the steam provides a certain quantity of the oxygen necessary to convert the carbon into carbon monoxide. The air maintains the furnace temperature essential for decomposing the steam in the presence of the red-hot coal; the oxygen of the steam unites with the coal to form carbon monoxide, and the hydrogen remains free. You will, therefore, see the enormous advantage the use of steam thus affords. Instead of free nitrogen, we get free hydrogen, which is not only a highly heating and combustible gas, but exceedingly light, and confers low specific gravity upon the gaseous products with which it is associated—a feature of considerable advantage where the gases have to be carried some distance before they are burned. Of course, the use of steam entails a consumption of the heat-energy of the furnace; and it becomes a rather nice point to so proportion the steam and air that the fuel can maintain sufficient heat to carry on the chemical transformation of the steam to combustible gases, and reduce at the same time the quantity of air to a minimum. The less the amount of air used, the less the proportion of inert nitrogen in our fuel gas—a point to be aimed at; and the greater the proportion of steam, the greater will be the heating power of our gas, providing always the requisite furnace heat be maintained to decompose the steam effectively. If we ascertain the heat generated in the furnace, and that expended in effecting the chemical transformation of a given weight of steam into combustible gases, the furnace temperature can be known; and this will guide us in determining what amount of steam may be used with success.

Having given the following data, let us calculate the results: 800 lbs. of steam supplied from a boiler at 300° Fahr.; 2240 lbs. of anthracite or coke, containing 240 lbs. of ash; 10,013 lbs. of air. We will allow for a loss of 20 per cent. of steam that will, in all probability, escape decomposition in the furnace; also for 10 per cent. of carbon burned to carbonic acid:—

Heat Production.	British Thermal Units.
1800 lbs. of carbon burned to CO = 1800 × 4,400	= 7,920,000
200 lbs. of carbon burned to CO^2 = 200 × 14,500	= 2,900,000
Heat carried in by steam 800 × 300° × 0·475	= 114,000
	10,934,000

Allow 20 per cent. of steam as wasted in escaping through the furnace without undergoing decomposition:

Heat Expended.	British Thermal Units.
160 lbs. heated from 300° Fahr. to (say) 1300° Fahr., 160 × 1000 × 0·475	= 76,000
Conversion of 640 lbs. of steam at 300° Fahr. (640 ÷ 9) × 53,900	= 3,832,290
Allow 10 per cent. loss in furnace by radiation, &c.	= 1,093,400
	5,001,690

Then 10,934,000 — 5,001,690 = 5,932,310 heat-units contained in the furnace.

Our furnace heat is determined as follows:—

CO_2	= 732 lbs.	× 0·2164 =	158·405
CO	= 4194 ,,	× 0·2480 =	1,040·212
N	= 7660 ,,	× 0·2440 =	1,869·040
H	= 71·11 ,,	× 3·4046 =	241·774
	12,658·11		3,309·431

And 3,309·431 ÷ 12,657·11 = 0·261, being the average specific heat; and 5,932,310 ÷ (12,657·11 × 0·261) = 800° Fahr., being the average furnace heat. The proportion of gases by volume will be as follows:—

	Cubic Feet.	
H	12,700	Combustible, about 39 per cent.
CO	53,700	
CO_2	6,000	Non-combustible, 61 per cent.
N	97,900	
	170,300	

Now, this temperature is much higher than is necessary for decomposing steam, and shows that our proportion of steam to air is too small for economical work. We may, therefore, increase the weight of steam with advantage. Let us increase the weight of steam one-third; making it 1200 lbs. We have then: Coal, 2240 lbs.; carbon, 2000 lbs.; steam, 1200 lbs.; air, 8810 lbs.

In these tables, I have not allowed for an excess of air, which is of course, essential in practice, and which will somewhat modify the results theoretically obtained.

Heat Produced.	British Thermal Units.
1800 lbs. (C to CO) = 1800 × 4,404	= 7,920,000
200 lbs. (C to CO_2) = 200 × 14,500	= 2,900,000
Heat carried in by steam 1200 × 300° × 0·475	= 171,000
	10,991,000

Heat Expended.	British Thermal Units.
20 per cent. escaped steam, 240° × 800 lbs. × 0·485	= 91,200
Conversion of 960 lbs. of steam (960 ÷ 9) × 53,900	= 5,748,900
10 per cent. loss by radiation	= 1,099,100
	6,939,200

Then, 10,991,000 — 6,939,200 = 4,051,800 heat-units in the furnace.

Then to ascertain the furnace temperature:

CO_2	= 733·00 lbs.	× 0·2164	= 158·621
CO	= 4,194·00 ,,	× 0·2479	= 1040·212
N	= 6,740·00 ,,	× 0·2440	= 1644·560
H	= 106·66 ,,	× 3·4046	= 362·644
	11,773·66		3206·037

Then 3,206·037 ÷ 11,773·66 = 0·272, the average specific heat; and 4,051,800 ÷ (11,744 × 0·2723) = 1280° Fahr., being the average furnace heat.

The amounts of the gaseous products by volume in this case are:

	Cubic Feet.	
H	= 19,000	Combustible, 44 per cent.
CO	= 53,700	
CO_2	= 6,000	Non-Combustible, 56 per cent.
N	= 85,800	

The total heat-units are as follows:—

H = 106·66 lbs. × 62,000	= 6,612,920
CO = 4194 lbs. × 4,325	= 18,139,050
	24,571,970

And 24,751,970 ÷ 164,500 = 151 British thermal units per cubic foot, which is nearly half the value of uncarburetted water gas.

Are these results the best attainable? I do not think so. In a properly constructed furnace, we ought to be able to obtain and maintain 50 per cent. of combustible gases from the total products. With care we can work at a lower temperature than that last obtained, because experience shows that gases do not leave at furnace heat. Supposing they leave at 800° Fahr., then the furnace temperature is increased: (480 × 0·272) ÷ 0·22 = 589° Fahr.; the temperature becoming 1869° Fahr. A large percentage of the heat ordinarily lost through the brickwork, as well as the sensible heat of the products may be utilized by heating the steam and air before they enter the furnace.

Of course, these calculations are based on theoretically perfect combustion, and no excess of air has been allowed. Under the best conditions, it is possible to decompose 1500 lbs. of steam to every ton of coal, providing the steam is furnished from an independent source, and to obtain approximately the following results:

		Weight. Pounds.	Volume. Cub. Ft.	Heat-Units.
Combustible	Hydrogen	166	29,800	10,333,292
	Carbonic oxide	4,194	53,700	18,139,050
Non-combustible	Nitrogen	5,179	65,500	—
	Carbonic acid	733	6,000	—
		10,272	155,000	28,472,342

This equals nearly 54 per cent. combustible products, and gives 183 heat-units to the cubic foot. Can this quality be generated continuously? Experience shows that it can, providing the steam and air are supplied at a sufficiently high temperature. With steam furnished from a separate boiler, at (say) 500° Fahr., no difficulty will be found in producing this quality of gas.

There is still the fuel requisite for supplying the steam to be calculated and allowed for in these results. To produce 1500 lbs. of steam from water at atmospheric temperature, and raise it to 500° Fahr., would necessitate a consumption of from one-eighth to one-quarter of a ton of coal; so that our results are reduced to 130,000 cubic feet of gas, containing 183 heat-units to the foot, or 23,500,000 heat-units to the ton of coal.

The question now naturally arises whether it is possible to generate the steam in the same furnace, and still maintain the quality of the gas. To do this we have only the waste heat of the furnace—*i.e.*, the sensible heat carried off by the gaseous products—and that radiated through the brickwork, to work with, since we cannot lower the temperature of the furnace without seriously affecting the quality of the gas. As shown, we need 2,500,000 British thermal units. Suppose the gases leave the generator at 500° Fahr. above the atmosphere. There are 10,250 lbs. × 600° × 0·272 = 1,600,000 British thermal units carried away by the gaseous products from a ton of fuel; and allowing 10 per cent. loss for radiation, &c., 1,090,000 units—making a total of about 3,750,000 heat-units. If it were practicable to utilize entirely this waste heat in producing and superheating the steam, the perfection of the gasification of coal would be reached; for there would be contained in the combustion of the gases 95 per cent. of the heat-units in the coal itself. By placing a superheater in the take-off pipe, and a superheating coil in the brickwork, a considerable amount of this waste heat becomes available.

Allowing for all contingencies, I believe it is possible to obtain, from 2240 lbs. of anthracite, from 150,000 to 160,000 cubic feet of semi-water gas, averaging 165 heat-units to the foot, which will contain 25 million units of potential heat, or about 83 per cent. of the heat energy of the coal itself. This system possesses, in my judgment, the best solution of the fuel-gas question. The cost of its production is trifling; and the labour attached to its manufacture (usually a considerable element in

the cost of gas) is very slight. With coal at $3 per ton, its cost of production should not exceed 2½ c. per 1000 cubic feet. In other words, we ought to obtain a million heat-units at a cost of 15 c. At the present price of Philadelphia city gas, this same quantity of heat costs $2·30.

The objections that are urged against the use of gas of this quality are that the presence of so much inert matter necessitates the use of larger pipes, and that combustion is maintained with difficulty. The first of these objections only applies where it is absolutely necessary to use the pipes already existing and hitherto employed for illuminating gas. If new pipes have to be put down, it is not so great an undertaking to lay a 9-inch pipe instead of a 6-inch, for instance, and should not prove a serious obstacle. But the same objection would hold good as against water gas. This gas contains only one-third the heating value of natural gas, and one-half that of coal gas. If a certain sized pipe were just sufficient to carry natural or coal gas, it would be too small for water gas, unless the pressure were considerably increased; and this would necessitate better laid mains and better joints than we are now accustomed to.

When gas becomes generally used for fuel, no such sizes of mains as those now employed for the supply of illuminating gas will furnish anything like the demand. Moreover, in the method of distribution I shall presently describe, this objection vanishes. The question becomes a mere arithmetical problem: Does the interest on the investment required to provide larger mains equal, exceed, or is it less than the value of the extra heat-units supplied? This is a simple problem; and its solution is an answer to this question. It is merely a question of dollars and cents.

The other objection urged is that there is difficulty in maintaining combustion. This objection is confined almost entirely to the gas known as producer gas—that made in blasting the furnace in the water-gas process, in which the combustible products do not exceed 35 per cent. With the gas I have described, combustion is readily maintained, especially when it is heated prior to ignition—a condition easily obtained for all ordinary purposes.

Water gas, made by what is known as the alternate method, consisting in alternating the steam and air blast, will furnish, under the best conditions, not more than 40,000 cubic feet of gas, containing 300 heat-units per foot—a total of 12,000,000 cubic feet to the ton of coal. It is composed almost entirely of carbon monoxide and hydrogen. The producer gas—that given off in blasting the furnace with air—is of too little heating value to convey long distances, and must be burned in large quantities to be effective. It is advantageous to use this under the boilers for furnishing steam.

The thermal intensity of water gas is very high, while its calorific value is less than half that of coal gas. Its success as a fuel depends solely on one point—the cost of distribution. It can be produced cheaply enough to warrant its introduction; but, unfortunately, the expense incurred in getting it from the holder to the consumer is generally greater than that of manufacturing and putting it into the holder. It is already in use for fuel in several cities, and is sold, I understand, at 40c. and 50c. per 1000 cubic feet. The latter figure is too much. Coal gas at $1·25—the price charged in New York City—is just as cheap for ordinary domestic purposes. To compete successfully with coal, water gas containing 300 heat-units to the foot should be sold at 20 c. per 1000 cubic feet, at which price there will be no difficulty in selling all that a company can produce in every city, except where natural gas is already supplied.

To recapitulate: Of the three methods for converting coal into gas for fuel—viz., by natural or forced draught without steam, by forced draught with steam, and by steam and air alternately, resulting in the generation of producer gas, semi-water gas and water gas respectively—semi-water gas contains 80 to 85 per cent. of the heating value of coal, and is the cheapest gas if supplied within a reasonable distance from the place of production. Producer gas must be burned hot as it issues from the producer, to be advantageous. Water gas contains only about two-fifths of the heating value of the coal from which it is produced, and is, *per se*, the most expensive of the three systems. Not the least of the advantages which semi-water gas, or "steam-jet" producer gas, as it is sometimes called, possesses over water or coal gas, is the ease and simplicity of its production. It can be made in a furnace not much larger than some that are in use for heating dwellings; it requires no storeage, is automatic in its production, and can be made in quantities varying from 500 cubic feet to an indefinite quantity per hour.

(To be continued.)

The Association of Sulphate of Ammonia Manufacturers.—The Honorary Secretary of this Association (Mr. G. E. Davis) has forwarded to us a copy of the report of the proceedings at the annual general meeting of members, held in Manchester last month, under the presidency of Mr. J. Hepworth, of Carlisle, together with the report of the Council, bye-laws, list of members, and specimens of the literature bearing upon the use of sulphate of ammonia which the Association are prepared to supply to gas managers for distribution. The pamphlet has been printed for private circulation.

REGISTER OF PATENTS.

Gas-Engines.—Robinson, H., of Manchester. No. 1083; Jan. 21, 1891. [8d.]

This invention relates to "improvements in engines in which the piston is propelled by the ignition and expansion of an explosive mixture of gas and air, or other supporter of combustion."

The piston of the engine is arranged to be propelled, as usual, at every second revolution of the crank-shaft, by means of an eccentric, or cam, or equivalent—preferably upon the crank-shaft of the engine; while a rod from the eccentric operates the exhaust-valve of the engine at the required times in the following manner: There is a wheel mounted on an axis in such a manner that the rod rests by gravity against teeth or cavities formed on the wheel. The pitch of these teeth may be a little less than the travel of the rod; and upon the rod a projection is formed in such a manner that it engages with the teeth. A spring may be used to bear upon the wheel, or a pawl or retaining catch may be employed; the object being to prevent the rotation of the wheel except in one direction. The rod moved at each revolution of the engine engages with the teeth of the wheel, and moves it onward—preferably one tooth or cavity at each revolution of the engine. The teeth are formed of different depths; and the rod is thus held in various positions, according to the depth or shape of the tooth upon which it is acting. The exhaust-valve of the engine is preferably placed with its axis about in line with the rod, which can thus act directly upon the exhaust-valve stalk, or elongation of the valve-stalk, when the rod is in contact with certain of the teeth. When, however, other teeth are in contact with the rod, they cause it to work in such a position that it misses the valve-stalk, and so no opening of the valve takes place. In the well-known cycle, consisting of an ignition at every second revolution of the engine, every alternate tooth or cavity on the wheel is of the form necessary to bring the eccentric rod into position to actuate the exhaust.

Preventing the Bursting of Water-Pipes through Frost.—Minshaw, J. H., of Battersea, Surrey. No. 2745; Feb. 14, 1891. [6d.]

This combination fitting (to be used in frosty weather, so as to prevent the bursting of water-supply or service pipes) is constructed with a stopcock in the centre, and two receiving or outlet sockets near each end. Into these sockets either draw-off taps or plugs are inserted before the combination stopcock is fixed in the service or supply-pipe near to the water-main in any house or building. Then, in the event of frosty weather, the water supply can be cut off, and the dead water be drained out of the pipes by unscrewing and taking out the plug at the side of the stopcock; or a draw-off tap may be inserted in the receiving or outlet socket in place of the plug, so as to prevent the pipes from freezing.

Actuating Gas-Taps.—Pain, A. C., of Edgbaston, Birmingham. No. 3021; Feb. 19, 1891. [8d.]

This invention refers to an appliance for actuating a gas-tap, in which a cord, wire, or other flexible connection is held taut by a spring arranged in opposition to a second spring in such manner that, when the cord is moved within a certain range, it remains in whatever position it may be left, and so sets the gas-tap in any desired position.

Regulator for Gas-Engines.—Fielding, J., of Gloucester. No. 3074; Feb. 20, 1891. [6d.]

When a gas motor engine receives its supply of gas from the main which supplies gas-jets, it is always found necessary to provide means for preventing the pulsation caused by the intermittent demand of the engine. According to the present invention, apparatus for this purpose consists of two or more chambers fitted with flexible diaphragms through which the gas is led to the engine; suitable regulating valves or plugs being provided in the passages running from one chamber to the other, the areas of such passages gradually increasing from the inlet to the outlet. Preferably such an apparatus consists of a short iron cylinder open at both ends, with a division-plate somewhat nearer one end than the other; the ends being closed by elastic rubber sheets or diaphragms, secured by rings and bolts. The cylinder thus forms two separate chambers, one having a greater capacity than the other. The gas supply from the main is led into the smaller chamber; and the engine supply is taken from the larger. A regulated passage connects the two chambers; its area being so reduced that a constant flow is required to supply sufficient gas for the engine. As, however, the engine only draws its supply intermittently, the larger chamber acts as a reservoir, while the flexible diaphragm in the smaller chamber maintains an equable pressure in the main. The efficiency of the regulator will, of course, be increased by the addition of other chambers and diaphragms.

Gas Motor Engines.—Fiddes, A. and F. A., of Bristol. No. 10,333; June 18, 1891. [11d.]

This invention has for its object the filling of the space or chamber in the cylinder beyond the stroke of the working piston with a combustible charge, so as to increase the power of the engine; and also to make use of the unexpended energy which remains after the working piston has completed its working or combustion stroke, to still further increase the power of the engine. The patentees have found it advantageous to fill the combustion or compression chamber referred to above with a fresh combustible mixture at or about the same time as the charge is being drawn in by the working piston. They thus gain greatly increased power according to the length of the stroke of the piston-valve and of the chamber referred to above, through having this space or chamber charged with combustible gases instead of burnt gases or smoke.

In the space or chamber beyond the working stroke of the piston is placed a piston-valve with a piston-rod attached to a connecting-rod, worked by a cam or cams on a counter-shaft driven by the crank-shaft at half the speed of the latter. The back end of the cylinder is provided with a hole, rather larger than the piston-rod, which admits air, so as to allow the piston-valve to work freely. Round the inside

edge of the hole, a valve-seating is turned; and round the piston-rod or the piston-valve is a corresponding seating, so that, when the piston-valve is drawn back by the cam or cams to the seating, it forms the valve, and makes it air-tight.

The cycle of operations of the engine is as follows: The working piston and the piston-valve meet at the exhaust port without quite touching; the working piston then makes its outstroke; and the piston-valve makes its backward stroke into the seating before-mentioned—each piston drawing in its respective charge, so as to entirely fill the cylinder with a combustible mixture. The piston-valve remains in its place during the time the working piston is making its in or compressing stroke, and also while it is making its outward or working stroke. When the piston has completed its out-stroke, the exhaust-valve opens; and both pistons then advance together, and nearly meet at the exhaust port. The operation is again repeated by the piston and piston-valve separating and drawing in their respective charges, as described.

On the front of the cylinder a cover is fitted, so that, between the cover and the front of the working piston, a chamber is formed in which to receive the shock or force of the unexpended energy left after the working stroke before mentioned, which is conveyed from the exhaust-valve by a passage. The products of combustion then pass out into the open air through a port in the cylinder. By another arrangement, the unexpended force referred to passes into a separate auxiliary cylinder or exhaust chamber, with a working piston in it connected to a clutch or ratchet on the crank-shaft, so as to assist the propelling power of the engine.

Gas-Motors.—King, J. T.; communicated from Connelley, J. S., of Plainfield, New Jersey, U.S.A. No. 14,002; Aug. 19, 1891. [8d.]

This invention relates to a gas-engine having a primary cylinder and a second charging cylinder, each provided with a piston, and being connected, and the primary cylinder being provided with a suction-operated valve for the inlet of the explosive charge, and with the piston adapted to open and close communication between the two cylinders, when the communication is established a suction is created, and the valve opened thereby.

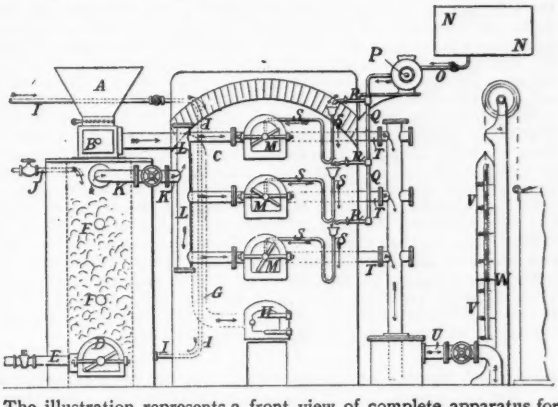
In his specification, the patentee remarks that, in the use of engines having a primary cylinder and second or charging cylinder, the action of the second cylinder and piston is noisy—so much so as to unfit the engines for use for many purposes. The reason for this is found to be as follows: It is impossible to make the connection between the piston and piston-rod of the second cylinder, and between the piston rod and crank, so exact that there shall be no loose motion of the parts; and when the piston is being started on its outstroke by the revolution of the main-shaft, the joints of the parts are separated to the fullest extent. It has been the practice heretofore not to admit the charge into the second cylinder until after the piston has thus commenced its outstroke; and the effect of the sudden force exerted on the piston by the entrance of the gases, is to force the parts quickly together with a jarring noise. One object of the present invention is to obviate this difficulty; and this is accomplished by so relating the positions of the cylinders with reference to their cranks, and the location of the exhaust port of the primary cylinder, that the exhaust from the primary cylinder into the second cylinder occurs just as the second piston is at the end of its instroke, and before the parts have been separated or loosened by the draft of the crank on the piston. The exhaust then, on entering the second cylinder, finds the joints of the parts all closed together, by the pushing of the crank on the piston, and therefore operated without any jar. As a useful auxiliary to this part of the invention, the patentee prefers to employ a cushioning device at the inner end of the second cylinder, which, as the piston reaches the end of its stroke, ensures the closing together of the joints, and holds them together until the charge has acted on the piston with its outward propulsion.

These parts of the invention are of use even when the engine is so used—opening of the exhaust-valve at the moment of the escape of the gases from the primary cylinder—that no effective power is transmitted to the second cylinder, which is employed only for the indraught of the next explosive charge. In such a case, the escape of the gases from the primary cylinder produces a blow on the piston of the second cylinder, which, though not sufficient to act appreciably to propel it, is enough to make the disagreeable noise above referred to if these improvements were not employed. They are also of material use when the parts are so arranged that the exhaust-valve in the second cylinder is closed at the time of the admission of the charge from the primary cylinder, in which case the charge will act propulsively on the piston of the second cylinder.

Another feature of the invention relates to the exhaust-valve, through which the exploded gases are discharged from the cylinders. Heretofore it has been the practice to employ an exhaust-valve communicating with the primary and second cylinders, and operated mechanically, so that it shall be closed at the time the discharge from the primary cylinder to the second cylinder occurs, and open during the back-stroke of the second piston. This would answer well enough if there were an explosion at every outstroke of the primary piston; but, as is well known, it is the general practice in operating gas-engines to employ a governor, so constructed and geared with the valve which admits the gas for the explosive charge that, when the engine runs above its normal speed, the valve shall be closed temporarily. The primary piston may thus make two or three successive strokes without explosions; and in such case, if no special device be used to prevent it, the second piston must, on its outstroke, create a vacuum which would seriously retard the motion of the engine. In order to prevent this, it has been common to employ a snifting-valve located at the rear of the second cylinder, and adapted to open when a partial vacuum is produced by the cause just mentioned. There are, however, serious objections to the use of a snifting-valve. If it is made to open easily, there is danger that it will open when suction is created in the cylinders by the normal action of the piston at the end of its stroke, in drawing in the explosive charge of gas and air; and this, of course, would interfere with the indraught of the charge. If it is made difficult to open, so as to overcome this danger, it is at the serious loss of power of the engine, which, on idle strokes, must part with considerable energy in overcoming the suction which occurs before the valve opens. Besides this, snifting-valves in any case are objectionable, because it is practically impossible to provide efficient and noiseless means for closing them with sufficient rapidity. These matters are provided for by employing an exhaust-valve, which is open in the first and last parts of the outstroke of the second piston. Of course, by this construction, power is lost by reason of the partial escape of the exploded gases while still under tension; but this is much more than overbalanced by the great saving of power which arises from the prevention of the difficulties usually incident to snifting-valves.

Manufacture and Storeage of Illuminating and Heating Gas.—Fourness, H., of Manchester. No. 15,469; Sept. 12, 1891. [8d.]

This invention relates to the manufacture and storeage of gas composed of a mixture of water gas and oil gas; means being provided whereby the gas carburetted in the producer can be additionally enriched in its passage through a fixing chamber or retort, and whereby the producer can be cleared of explosive mixtures previous to blowing in air to re-heat the coke or contents of the producer. The invention further relates to details of the apparatus, and means whereby gases can be mixed in the storeage vessel or holder in certain fixed and easily ascertainable proportions.



The illustration represents a front view of complete apparatus for carrying the invention into effect.

The producer is constructed in the ordinary manner—that is to say, it consists of an outer casing of metal, lined with fire-brick or other refractory material. At the top there is a hopper A, through which the coke or the other material employed is fed into the interior. At the foot of the hopper is a sliding damper, which is opened to admit the coke to the producer, and closed when a sufficiency has been placed therein. Beneath the damper is a sliding-valve B, which is also drawn out when the coke is being supplied, and is kept drawn out after the damper has been shut, to allow the producer gas to pass along the pipe C to the flue G and furnace H when the coke is being blown up. In the illustration, the damper and the valve are shown closed, as in the case when carburetted water gas is being produced. At the foot of the producer, there is a combustion port D, in which lighted fuel is placed, and is blown up by an air blast through the pipe E, which is connected to a fan or other air-forcing means. Thus the coke in the producer can be rendered incandescent; a couple of spy-holes F enabling the operator to judge when it is sufficiently hot. During the process of rendering the coke incandescent, the producer gas evolved is led through the producer gas-pipe E to a flue G in the side of the brick retort-setting, through which it is passed to the furnace H beneath the retorts, and is therein consumed, so as to reduce the consumption of fuel in the retort-furnace, and utilize the producer gas. When the coke is rendered thoroughly incandescent, the valve B is closed, so as to cut off the supply of producer gas to the furnace H; and the blast is at the same time cut off.

To produce water gas, steam from any suitable generator is led by a pipe I preferably through the flue G, so as to superheat the steam, and then direct into the bottom part of the producer among the incandescent coke. The steam, in rising through the incandescent coke, becomes decomposed and forms water gas. At the same time a supply of crude heavy oil of the cheapest description is sent through the pipe J, and let fall upon the top of the hot coke. The pipe J is preferably formed with a syphon bend, to prevent the crude oil from being at times forced back. The crude oil begins to vaporize as soon as it touches the hot coke; and it is entirely vaporized as it permeates downward, except the very heavy carbonaceous residuum which adheres to the coke. As the water gas rises upward, it meets and mixes with the oil gas or vaporized crude oil. The mixture of oil and water gas is next led through the pipe K to the pipe L, from which branches project to the several retorts M.

As already stated, the retorts are heated by a furnace H; and their function is to fix and render stable the mixture of water and oil gas which is caused to enter them from the producer. The patentee remarks that the retorts are empty, and do not contain any of the usual checker work or broken bricks, or materials ordinarily supposed to be essential to the fixing operation. In vaporizing the crude heavy oils which it is his purpose to utilize on account of their cheapness, he finds that, as a rule, the mixture on leaving the producer is deficient in richness; and an important part of the invention therefore refers to means whereby he claims to be enabled to make good this deficiency in richness by vaporizing in the retort a further supply of lighter oil, in order to confer the necessary illuminating power upon the mixture—the whole being fixed by the hot retorts, so as to constitute a stable gas of a high illuminating power. These means are as follows: There is a cistern N containing a quantity of light oil, which is led by a pipe O (governed by a stop-valve), through an oil-meter P, to a stand-pipe Q, from which taps R extend to fillers

mounted on syphon bends S, by which the oil is run into the front of the retorts; the pipe S extending a short distance along the interior of each retort, and terminating in an open end. The heat of the retort vaporizes the oil in the tube; and the vapour issues from the end of the pipe into the retort, where it thoroughly mixes with the carburetted water gas already admitted from the producer. As it passes through the retort, the enriched gas is exposed to the full heat; and it is thus fixed and changed into a stable gas, which "can be stored or carried for distances in pipes without deteriorating." To further improve its quality, the gas as it leaves the back of the retorts through pipes T is led to the stand-pipe and hydraulic main, where it is further purified, and thence through the pipe U to the holder. A standard V (marked with figures representing feet of gas) is erected close to the holder; and an index W, raised and lowered by the holder, indicates the exact quantity of gas in the latter.

A noteworthy feature of his apparatus, the patentee here remarks, is that, owing to the particular arrangement, he is enabled to avert the explosions which sometimes take place in producers in which the water gas is also carburetted by the admission of oil. These explosions are caused by the admission of air to blow up the coke again into a state of incandescence at a time when oil vapours are still present in the producer. According to his proposed method, when the coke is becoming too cold to properly decompose the steam or vaporize the oil, instead of shutting the connection to the retorts by screwing down the stop-valve X, and then opening the producer gas-pipe E, previous to turning on the blast, he simply stops the supply of crude oil, and continues to blow steam through the producer and into the retorts. By this means the carbon and oil vapours are entirely carried off; and the coke is cleansed from a good deal of the carbonaceous residuum, besides the retorts being also cleansed by the blow-through. The water gas as it passes through the retorts is sufficiently enriched from the light oil pipes S to prevent it from having a deteriorating effect upon the gas in the holder. Indeed, were it not for the presence of these secondary and subsidiary light oil vaporizing-pipes, it would not thus be possible to blow pure water through the retorts to the holder without seriously affecting the quality of the gas in the holder. Having thus cleared the producer of oil vapours, the blast can now with safety be turned on; and this is done after closing the valve X, so as to cut off the way to the retorts, and opening the valve B to allow the producer gas to find its way to the furnace. When the coke has been thus sufficiently re-heated, the oil and steam are again turned on, and the process of gas making resumed.

Ovens and Retorts for the Manufacture of Coke and Illuminating Gas.—Creswick, W., of Walton, near Wakefield. No. 17,222; Oct. 9, 1891. [11d.]

This invention relates to means for utilizing the heated gases passing off from coke-ovens for the purpose of carbonizing coal in closed retorts, so constructed that gas and bye-products (ammonia, tar, &c.) are generated in the roasting of such coal, and are collected for use elsewhere.

To effect this the patentee provides a series of ovens with exit apertures into a large receiving flue or chamber, and also a range of retorts around any of which heated gases can be led from the receiving-flue, and allowed to pass to an exit-flue. The filling and emptying of the retorts is done through charging openings at the top, or through openings at the front in the ordinary way.

Assuming the work to be in operation, the process is (shortly) this: When the coal in any of the ovens is sufficiently carbonized, the dampers are closed, the coke withdrawn, and another charge of coal introduced. The door of the oven is then shut; and the coal will in all probability take fire from the heat of the previous charge, or from that of the neighbouring ovens (if not, it will have to be assisted in the usual way by fire). On this taking place, the damper (if closed) is opened to allow the gas to escape; and a "suitable" quantity of air is admitted into the oven from the outside, so as to consume the gases from the heated coal, and to facilitate its carbonization. These gases become incandescent, and, actuated by a partial vacuum, pass from the oven in a course directed by means of regulator-dampers around the retorts. When the coal is fully carbonized, the valve on the gas-pipe is closed; the air-tight mouthpiece is removed from the door, and the coke is withdrawn. Another charge of coal is then introduced, either through the aperture at the top of the retort or through the door; and the air-tight mouthpiece and the covering of the aperture are replaced, and the carbonizing of the charge goes on. The regulator on the gas-pipe is now opened; and the liberated gases and bye-products from the heated charge of coal in the retorts, actuated by a partial vacuum, or by the pressure of the gas (or by both) in the retorts, pass out of the retorts or ovens by the pipe leading through a water-sealed joint, and are then dealt with in any convenient manner.

According to a second arrangement of ovens and retorts, the patentee proposes to employ coke-ovens in which coal is carbonized, and its volatile constituents mixed with a judicious quantity of air, which takes the form of gas and becomes incandescent. This gas is allowed to escape, through suitable apertures governed by regulators, into a flue or chamber; and thence, through other apertures governed by regulators, it is made to pass into chambers, in which ordinary gas-retorts are fixed in the usual way, and around which it plays. Thence, by means of passages (again governed by regulators), it passes into the main flue.

Regenerative Gas-Lamp for Railway-Carriages.—Collins, I. J., of City Road, London. No. 19,226; Nov. 6, 1891. [6d.]

This invention refers to the construction of an external casing and shields for a regenerative gas-lamp to be placed in the roof of a railway-carriage; the lamp which the casing, &c., is specially designed to suit being that described in patent No. 10,447 of 1889. The opening through the carriage roof is surrounded by an angle-iron ring, shouldered at its upper edge to receive the outer casing. The gas-pipe stretches from side to side of the lamp, and has, at its middle within the lamp, a T with a branch descending to the burner. Within the outer casing there is an inner casing narrowed in at the top, and with a reduced tubular part extending to about the height of the chimney. Above the chimney is a cover, with an internal conical deflector. The outer and inner casings are both perforated with holes for the admission and emission of air and products of combustion; and the upper holes of the outer casing are further shielded by a cylindrical casing. Air enters by the holes in the lower part of the outer casing. A portion of it goes to supply the lamp (entering the regenerative heating chamber by triangular openings in the central shaft), and also a small chamber above the burner itself; and the excess—caused to enter by wind gusts, or by the rapid passage of the casing through the air—finds its way upwards, and out with the products of combustion through the shielded outlets at the upper part of the casing.

Heating Attachment for Lamp and Gas-Burners.—Johnson, J. Y.; communicated from R. S. Merrill, of Boston, U.S.A. No. 19,485; Nov. 10, 1891. [6d.]

This heating attachment for lamp or gas-burners consists of a drum or chamber, with a central opening in its bottom to receive the chimney of the lamp or gas-burner, and provided with clasps or holders for keeping it in place thereon, and with openings in its top, at or near the periphery or rim of the drum or chamber, to allow a free passage of the heated air and products of combustion from the lamp or burner.

APPLICATIONS FOR LETTERS PATENT.

520.—Higginson, J., jun., "Gas-engines." Jan. 11.
524.—Wilkinson, J., "Working gas-engines." Jan. 11.
535.—Wilson, G. M. S., "Manufacture of gas." Jan. 11.
587.—Thwaites, R. G., "Preventing water and gas pipes from freezing." Jan. 12.
589.—Phillips, J., "Preventing pipes bursting during frost." Jan. 12
719.—Altmann, A., "Gas-pressure governors or regulators." Jan. 13.
743.—Bray, G., "Lamps." Jan. 14.
765.—Fox, S., "Furnaces for the application of water gas for heating and welding purposes." Jan. 14.
773.—Falk, Stadelmann, and Co., Ltd., "Lamps." A communication from S. Falk. Jan. 14.
829.—Hall, J. W., "Gas-producer and other furnaces." Jan. 15.
836.—Strathern, A. M. and A. G., "Governing or regulating the pressure or flow of illuminating gas or other fluids." Jan. 15.
845.—Newton, H. E., "Gas-furnaces." A communication from R. N. Oakman, jun. Jan. 15.
864.—Ruscoe, J., "Charging gas-retorts." Jan. 15.
926.—Simon, R., "Gas and like engines." Jan. 16.

Another Electric Fire in Liverpool.—There was a repetition last Wednesday morning, though on a smaller scale, of the "electric fire" which took place a few days ago in one of the supply-boxes of the Liverpool Electric Supply Company. Shortly before ten o'clock, a considerable volume of smoke was discovered issuing from a supply-box inserted in the pavement at the corner of Dale Street and Hatton Garden. The Electric Lighting Company were at once informed of it; and a workman was sent to open the box and cool the overheated wires—his explanation of the occurrence being that the wires had "just got a little warm."

Complaints as to Inadequate Gas Supply at Manchester.—Despite the assurance given, at a recent meeting of the Manchester City Council, that there would not again be any occasion for complaint as to the diminution of the gas supply, there has been (says the *Manchester Guardian* on the 18th inst.) a good deal of grumbling within the past week in consequence of the insufficiency of the supply. Not only people who make use of gas for illuminating purposes, but those who use it as a motor and for cooking purposes, appear to be exceedingly discontented with the treatment they are receiving in this respect at the hands of the gas authorities. It has been stated from time to time that the gas-making plant is being extended, and that a considerable increase in the holder capacity of the works is in contemplation. It is difficult to understand why such arrangements should have been so long delayed, and why they are not being pushed forward more rapidly now that they have been entered upon.

The Remuneration of the Manager of the Coventry Gas-Works.—Last Wednesday the Gas Committee of the Coventry Corporation held a meeting to consider the remuneration of their Manager (Mr. G. Winstanley). Mr. Winstanley has been Manager for about six years, at a salary of £500 a year, and a commission of 1d. per 1000 cubic feet of gas manufactured above 180 million cubic feet per annum. His average annual emolument during the whole period has been £618. But owing to the increased consumption, it was more than £900 last year; and at the present rate of progress, it would have exceeded £1200 before the existing arrangement with him had expired. A resolution was moved that Mr. Winstanley be paid a fixed salary of £850 a year, to which an amendment was proposed that it be £750. The latter, however, was lost by a large majority; and the resolution was carried. It was stated that Mr. Winstanley derives no pecuniary benefit whatever from the use of his patents at the gas-works.

Stoke Corporation Gas Supply.—At the meeting of the Stoke Town Council last Thursday, the Gas Committee recommended that Mr. Alfred Lass be called in, to give his opinion as to the cost of production and the selling price of gas, and as to whether any profit was made on the supply to the North Staffordshire Railway Company during the year 1890-1; statistics given by Mr. Geen (a member of the Council) and the Gas Manager on the matter being contradictory. Mr. Geen, who was absent, wrote asking the Council to request Mr. Lass to report—(1) As to the cost of gas manufactured and "delivered at the doors of the ratepayers;" (2) the quantity of gas sold and so delivered; (3) the average selling prices; (4) the quantity of gas sold and delivered to the Railway Company at 2s. 3d. per 1000 cubic feet; (5) what profit, if any, was made on the same; (6) what sum, if any, should have been set aside on account of depreciation, sinking funds, and bad debts; and (7) how much, if any, of the sums charged to capital during the three years ended March 31, 1891, should have been charged to revenue. A discussion followed; and the Committee's report, with the addition of Mr. Geen's suggestions, was adopted.

CORRESPONDENCE.

[We are not responsible for opinions expressed by correspondents.]

Standards of Light.

SIR,—Following up my letter of last week on the above subject, I have, in the first place, one slight correction to make—viz., No. 1 of my recommendations should read: "That the future standard should be *of the type* of the pentane Argand, &c.," in place of "That the future standard *should be* the pentane Argand, &c."

I will now deal *seriatim* with my recommendations.

With regard to No. 1, I find, as the result of many experiments, that an Argand burner in which the light from the upper portion of the flame is cut off by a screen, is the most reliable as a standard for general work. Even with ordinary gas, the flame may be turned up or down, above or below its normal 3 inches, to an extent far beyond the possible errors of a reasonably careful operator, without materially affecting the light emitted by the portion of the flame used as a standard. With carburetted gas, and with a strictly defined mode of operation, as recommended by Mr. Vernon Harcourt for his table photometer, the standard is even more reliable; but the possible effects on ratio between height of flame and illuminating power, in the event of gas companies introducing water gas, has to be considered. Mainly for this reason, I prefer a special burner of the type proposed by Mr. Dibdin, in which fully carburetted air is employed. Air as a gaseous medium for carrying the vapour of pentane is reliable, as being of constant composition. Pentane is equally reliable; and the special form of burner manufactured by Mr. Sugg for this standard gives a peculiar form of flame tapering at the apex, and therefore more easy of accurate adjustment as to light. That it is desirable to have a 16-candle standard for testing 16-candle gas, I advocate for the reason that an equi-distance between the photometer screen and the two lights would overcome any error introduced through the partial opacity of the air, as during the prevalence of fog. Also that the standard and the gas to be tested both being approximately of equal illuminating power, and both being flames produced in similar types of burner, photometrical errors arising from varying hygrometric and barometric effects on flame intensity would be minimized.

With regard to recommendation No. 2, after long experience in the working of the Harcourt table photometer, I prefer it, apart from its other conveniences, for the reason that it at once abolishes all possible dispute as to conditions of ventilation, which so much affect any form of enclosed apparatus.

Recommendation No. 3 is made for the reason that not only does temperature affect the hygrometric condition of the air, and may thus interfere with the luminosity of flame, but I have found, with ordinary experimental wet meters, that rapid changes in the temperature of the water sensibly affect the light of the gas—a result I attribute to the varying capacity of water to absorb hydrocarbons with corresponding variations of temperature. The necessity of defining conditions as to the size of room and ventilation is essential to secure uniformity in conditions of testing, which at present is, unfortunately, "conspicuous by its absence."

Recommendation No. 4 requires little comment. All your readers who have followed photometrical questions must be acquainted with Mr. Methven's experiments as to the effect of varying proportions of aqueous vapour in air on the luminosity of flame. The fact that the luminosity of a given flame will vary with the density of the surrounding air is also well known.

Recommendation No. 5, I regard as very important. In the first place, a constant 16-candle flame is necessary, if we require equi-distance between the screen and the two flames, where a 16-candle standard is employed. In the second place, it is well known (I sent the account of certain experiments of my own to the JOURNAL some years ago) that the Sugg "London" Argand is specially constructed for 16-candle gas, and that, where the candle power is less, the burner does not do justice to the gas. The development of a light of 16-candle power from ordinary coal gas in a particular form of burner may be stated roughly to depend on the ratio between the hydrocarbons present and the air supply. The latter is regulated by the general construction of the burner and the height and diameter of the chimney. It must therefore be obvious that conditions of air supply suitable for the development of the light of 16-candle gas would be excessive as applied to (say) 15-candle gas. Let anyone try the experiment of testing a gas giving a light of 15 candles in the standard burner at the rigid 5-foot consumption, then *turn up the gas* to a height of about 3½ inches, then take the gas consumption and the illuminating power, and calculate the value of 5 feet. The result will be at least 15·5 candles. This result is really due to *a restoration of the ratio between the hydrocarbons in the gas and the air supply, by increasing the proportion of gas consumed.* If the standard burner, at a rigid 5-foot consumption, so far damages low-quality gas as to possibly involve the gas companies in a heavy penalty, and considering the improved light that can now be obtained from gas by modern appliances, whereas the burner used in testing is of many years' standing, the claim for abandoning the present rigid 5-foot consumption is well sustained, and should be regarded as a moderate demand.

Jan. 23, 1892. H. LEICESTER GREVILLE, F.I.C., &c.

SIR,—In the late Mr. F. W. Hartley's "Gas Analyst's Manual" occurs the following passage: "Many gas companies are still in an unfortunate position under the clauses of their Acts of Parliament, and of those of the Gas-Works Clauses Act Amendment Act, 1871, Schedule A of which recites that 'the burner to be used for testing shall be such as shall be prescribed.'" It is as necessary to have a universal standard burner at one end of the photometer as at the other; and I think this is the meaning that, in common justice, should be put upon it. It is an unpleasant fact that, although one may be supplying 16-candle gas by the old Act, he may be made to wince if the authorities insist on testing with the burner with "15 holes and a 7-inch chimney."

Jan. 20, 1892. A COUNTRY MANAGER.

The Prevention of Freezing of Gasholder Lutes.

SIR,—I have received many communications on this subject; the evident intention of the writers being to utilize gas for the purpose. The practical difficulties in dealing with this fuel on a large scale are such that I cannot see how it can be applied to advantage. The wind, the large consumption necessary, and the connections, are all sources of difficulty and trouble; and the result would probably be only annoyance and failure.

A possible solution of the difficulty may be found in the use of a small portable boiler, made from a coil of 1½-inch steam-pipe (say, nine or ten coils on a 10-inch mandril); this coil being fixed in a sheet-iron casing, with cast-iron fire-bars about 4 inches below the bottom coil—the fuel being coke. If this were connected with the water-lute by ordinary fire-hose, with a hook end for the flow, and one for the return, a very rapid circulation would at once begin; and, as a matter of practice, it will be found that the water in a 14 in. by 10 in. lute in a holder 150 feet in diameter can be heated 15° Fahr. by the consumption of ¼ cwt. of coke.

It is probable that this would prevent freezing during the severest weather. Such a boiler could be made at a very small cost by any of the makers of wrought-iron pipes; and many similar have been made for me by Messrs. Edwin Lewis and Sons, of Wolverhampton, for other purposes. The experiment would cost little to try; and, if desired, I should be pleased to give any assistance, although the matter is so simple that it is not likely any would be necessary.

The boiler specified is possibly rather small; and with so cheap a fuel as coke, it might perhaps be made larger with advantage. My own experience has been only with small boilers, the largest of which is eight coils on a 10-inch mandril; the pipe being 2-inch bore. It is possible that, if ten or twelve coils of 2-inch pipe were used, the boiler would still be easily portable, and would have a large margin of power. Gas for such a purpose I feel convinced would be a mistake. It is a fuel only for small, exact, and intermittent work; and its application should be strictly confined to purposes where it can be used easily and to advantage.

Warrington, Jan. 22, 1892. THOS. FLETCHER.

Eschka's Method of Determining Sulphur in Coal.

SIR,—The description of this excellent method of determining sulphur in coal, which is equally applicable to coke, given on p. 111, of the last number of the JOURNAL, is somewhat incomplete, and the 15 grammes of magnesia and soda mixture mentioned should read 1·5 grammes. Many samples will require rather more frequent stirring than that indicated, to complete the combustion; and the heating must be cautious and gradual. Eschka also recommends that, after the combustion is complete, and the crucible and its contents are quite cool, from 0·5 to 1 gramme of ammonium nitrate should be stirred intimately into the mixture with a glass rod, the lid put on, and the whole heated to redness for some ten minutes. Another important precaution is to make a blank experiment with a similar quantity of the magnesia and sodium carbonate, under as nearly as possible precisely similar conditions. Even with the purest chemicals, an appreciable quantity of sulphuric acid will be found to be present; and this, of course, must be deducted from the result obtained from the coal or coke experimented upon, to give the net quantity present in the fuel. With these precautions, the method gives consistent and satisfactory results.

Salisbury, Jan. 20, 1892. N. H. HUMPHRYS.

Boiling with Coal Gas.

SIR,—In the last issue of the JOURNAL (p. 108), appended to the report of some experiments by Herr Coglievina, of Vienna, he is reported to have stated that "the commonest fault of all types of boiling apparatus lies in the fact that the flame only plays on parts of the bottom of the boiler," and that "improvements can be best effected by securing an even spreading-out of the flame." This is an "opinion" evidently not based on experiment, as the actual facts are exactly the reverse. Other things being equal, the smaller the flame, and the more concentrated it is on the centre of the bottom of the vessel, the higher the duty. In a series of experiments made to determine this point, the diffusion of the flame in one case showed a waste of no less than 30 per cent. It is to be regretted that Herr Coglievina published this opinion without making the necessary experiments to prove it, or, rather, to prove its fallacy. The higher duty of small concentrated flames is only to be expected, as the smaller the area of the flame, the larger the surface available to absorb the remaining heat of the products of combustion; the results proving that theory and practice agree.

Warrington, Jan. 21, 1892. THOS. FLETCHER.

Gas Exhibition and Cookery Lectures at Sheffield.—In conjunction with the Gas Company, an exhibition of gas appliances is now being held by Messrs. Richmond and Co., Limited, of Warrington and London, in the Music Hall, Sheffield. At the opening of the exhibition on Monday last week, Mr. Richmond explained that the object of an exhibition of this nature was to prove that the best thing for cooking and heating of dwellings was gas. A number of large towns had taken up the idea somewhat prominently; but Sheffield had not yet done so. In Leicester, between 4000 and 5000 houses used gas for cooking purposes; but in Sheffield only some 400 ranges were out on hire. The Sheffield Gas Company were willing to purchase whatever gas-stove a householder might desire, and let it out to him. With regard to the exhibits, the Gas Company have an elaborate stand, on which are displayed a great variety of chandeliers, brackets, globes, and ornamental fittings of all kinds. Messrs. Richmond and Co. show their cooking-ranges in five different sizes, and samples of the various heating-stoves; among the latter being the "Victor" and "Superb." Cooking demonstrations are given each afternoon and evening by Miss E. E. Golding. The exhibition, which has been fairly well patronized, will be continued during the present week.

MISCELLANEOUS NEWS.

THE PROPOSED GAS-WORKS EXTENSIONS AT ROCHDALE.

Opposition of Property Owners.

Last Wednesday week, Colonel W. M. Ducat, R. E., one of the Inspectors of the Local Government Board, held a public inquiry with respect to the application of the Rochdale Corporation for a Provisional Order to enable them to use certain lands adjoining the gas-works for the manufacture and storeage of gas and of the residual products.

Mr. T. B. BALL, the Gas Engineer, was called, and stated generally why the Corporation needed to acquire the land referred to. During the past twenty years, he said, the consumption of gas had practically doubled, and the demand was constantly increasing; so that their powers of production were now taxed to the uttermost. The total number of retorts of all descriptions in the works was 417; and the estimated yield in the 24 hours was 2,230,000 cubic feet, but they had actually made 2,135,000 cubic feet. The amount sent out in one day had been as much as 2,444,000 feet; and for days together the demand had exceeded 2,250,000 cubic feet. The difference between what they could produce per day and the amount sent out from the works, was made good on Sundays. The total storeage capacity of the holders was 1,865,000 cubic feet; whereas, as already stated, one day's consumption had been as much as 2,444,000 feet. In a manufacturing district like theirs, where they were constantly subject to heavy calls on the gas-works, it was very desirable that the storeage should be at least equal to one day's requirements; otherwise, when there was a heavy demand, the consumers could not get a proper supply, and in consequence there were complaints. This statement, he thought, showed the pressing necessity which existed for additional producing power and storeage accommodation.

Mr. RIPLEY said he was instructed by Mr. B. Stott, who owned eighteen adjoining cottages, to object very strongly to the land in question being used for any noxious work in connection with gas production or manufacture of residuals. The cottages were only 12 feet from one plot of land which the Corporation now sought to acquire; and if any offensive work was carried on there, the health of his client's tenants would suffer, and the property deteriorate in value.

The INSPECTOR remarked that Mr. Stott erected the cottages knowing that the gas-works existed there, and the only difference now was that the works would be brought nearer.

The TOWN CLERK said there had been no complaint for years in relation to the gas-works; and the object of the Corporation had been at all times to prevent any nuisance arising, so far as it could be prevented in such a place. The new works would be constructed on principles much better than those of the present works.

Mr. RIPLEY observed that he did not object to a gasholder or retort-house so much as to the manufacture of residuals.

Mr. RAMSBOTTOM said he appeared for himself and seven other owners of houses on the westerly side of Manchester Road. They urged that the high-level road which it was proposed to make would be a great annoyance to the tenants of these houses, which were more liable to be damaged than ordinary cottage property. They were built before the manufacture of residuals was commenced; and he was not aware that there were then any injurious smells. Since then, however, there had been a perpetual nuisance; and on many occasions complaints had been made to the Gas Committee (verbally and by letter) of the stench arising from the works. He understood that it was proposed to put a retort-house and coal-store on land now used for residual purposes; and he contended that the coal-store would be almost a greater nuisance than the residuals, as the dirt and dust arising from it would greatly depreciate the value of their property.

Mr. BALL denied that he or the Committee had received any complaint, either verbal or written, from Mr. Ramsbottom or any tenant during the past three or four years.

Mr. WOOLFENDEN and Mr. WALLWORK, owners of property near the works, also objected to the manufacture of residuals, to which they attributed the depreciation in the value of surrounding houses.

The Rev. J. GIBSON urged that the proposed extensions would increase the nuisance from the works, which was already intolerable. The stench was abominable both by day and night; and he had heard frequent complaints on the subject.

The inquiry shortly afterwards ended; and the Inspector then went to view the gas-works.

SUGGESTED PURCHASE OF THE PONTYPRIDD GAS-WORKS BY THE LOCAL BOARD.

At the last Meeting of the Pontypridd Local Board, a large deputation, representing the Pontypridd Chamber of Trade and the Pontypridd Ratepayers' Association, waited upon the Board to complain of the lighting of the town, and to urge upon them the advisability of either purchasing the present gas-works or of undertaking the lighting of the town by electricity or some other illuminant. The deputation was introduced by Mr. H. S. Davies, the President of the Chamber of Trade, who said that, having regard to the ineffective lighting of the town and the very inferior quality of the gas supplied, the bodies represented by the deputation considered it was incumbent on the Board to consider the question with a view to taking over the lighting themselves. They found that in England and Wales there were 178 authorities who had the gas supply in their own hands; and in most of these cases the revenue from the gas-works was not only sufficient to pay all expenses in connection with it, but also to considerably reduce the rates. In many large towns as much as £20,000 or £30,000 per annum had been saved to the rates from the profits made on the gas-works. The Board of Trade returns relating to gas undertakings showed that of 416 companies in 1890, 37 only paid less than 5 per cent.; 29 paid 5 per cent.; 133 paid between 5 and 10 per cent.; 48 paid between 10 and 15 per cent.; one paid 16¼ per cent.; and one paid 32½ per cent. The last, he should explain, was the Pontypridd Gas Company, though it did not appear from the return that they had paid anything during the previous two years. Other members of the deputation having spoken, the Chairman of the Board (Mr. D. Leyshon) observed that the question of lighting had frequently been before the Board; and personally he was glad the deputation had waited upon them. A deputation from the Board had had an interview with the Directors of the Gas Company, and had put the matter before them as strongly as they could. They were informed that, owing to the extraordinary increase in the consumption of gas in the district, the Company had had some difficulty in meeting the demand; but the Directors promised they would do everything they could to meet the requirements of the consumers, and intimated that they intended expending £20,000 on new plant. In the course of the subsequent discussion, Mr. Roberts said that he heartily agreed with the proposal to purchase the gas-works. Mr. Snape considered that the capital of the Company was not sufficient to properly meet the requirements of the district. Mr. J. Roberts thought the best plan would be to engage an expert to report to the Board on the matter. He felt confident that the purchase of the gas-works would be a profitable undertaking. After some further discussion, the deputation withdrew, when the Board decided that the Gas Company should be communicated with, in order to ascertain whether they were prepared to treat with them for the sale of the works, and also that an expert should be engaged to assist the Board in the matter, and to value the works.

JOHANNESBURG GAS COMPANY, LIMITED.

At the Annual General Meeting of this Company, held at the Offices in Johannesburg on the 7th ult., the Directors presented to the shareholders a report on the progress of the undertaking, of which the following is a full abstract.

The Directors commence by expressing regret that, since the previous statement of accounts was laid before the proprietors, the progress of the Company had not been so satisfactory as could be wished. It was expected, however, that in the immediate future the financial and other difficulties would be fully overcome. To clear off existing liabilities, and to provide further working capital, authority was obtained at an extraordinary general meeting, held on Oct. 8, 1890, to raise £50,000 by debentures of £100 each, to be issued at £85, bearing interest at the rate of 10 per cent. per annum. After some difficulty, this amount was eventually subscribed. The balance of the proceeds, after paying off the principal creditors, has been expended upon the prosecution of the gas-works and the purchase of the electric light concession. According to the accounts, there are existing liabilities of £7130, mainly for interest due on debentures and arrears of salary. As to the assets, there was on Nov. 30 last a cash balance in hand of £1768, which is being used in carrying on the works.

The Company's plans for the manufacture and distribution of gas were approved by the Government on Aug. 20, 1889. According to the terms of the concession, the works had to be completed within 18 months thereafter, or on the 20th of February, 1891. Owing, however, to the rapid increase in the town, and the fact that it had been found advisable to order about double the quantity of plant originally calculated upon; and in consequence of the exceptionally high rates of transport which then prevailed, the Company were placed in temporary financial difficulties. The Board, therefore, approached the Government, asking for an extension of time for the completion of the works. The Government acceded to the request, and granted six months—viz., to the 20th of August, 1891. Finding that the debentures could not be raised in time to complete the works by that date, the Directors again approached the Government, and asked a further extension—offering as a condition that some of the principal streets of Johannesburg should be lit by electricity (the Company having previously acquired the electric light concession). To this request the Government kindly acceded, and granted a further twelve months for the gas concession on the condition named.

The electric light concession was acquired on May 6, 1891, for £6000 cash, payable in instalments, and 8000 shares in the capital of a new Company that might be floated for £250,000, or a less number of shares in proportion to a smaller capital than the amount stated. The acquisition of this concession prevents any probable opposition in the lighting of Johannesburg. The Directors consider that for some purposes probably the electric light will be preferred to gas; but they are of opinion that gas will be much more in favour, as it can be used for both cooking and heating purposes, besides being very much cheaper to the consumer than the electric light. In order to meet the conditions of the Government, it has also been found useful as a means of temporary street lighting. This concession covers a period of 50 years, from Feb. 28, 1889, of which, for the first ten years, the right is exclusive.

On the 5th of May last the consent of the Government was obtained to the acquisition of the electric light concession by the Company, and the establishment of a new Company in Europe for the purpose of working these concessions. Steps were accordingly taken by the Directors to form a new Company; and Mr. Lance, the Managing Director, was requested by the Board to proceed to London, and arrange details of re-construction. Meetings were held, and the resolutions necessary for the dissolution of the old Company and the formation of a new one were duly carried.

With regard to the gas-works, a considerable amount of work has been done during the past few months, as shown by the report of Mr. W. Carr, the Clerk of Works (noticed below). There is every reason to hope that the Company will be able to supply a part of the town with gas about the latter end of the present, or the early part of next month.

Following advices from the London Committee, the Directors accepted, on the 31st of October last, the tender of Messrs. Woodhouse and Rawson United, Limited, for the supply and erection of nine arc lamps for public lighting, with engine, dynamo, and fittings. The work was pushed on with all speed by Mr. Cousins, the Consulting Engineer; and the light was installed on the 9th of December.

The following are the principal portions of Mr. Carr's report to the Directors on the progress of the gas-works: After my last report to you, the eastern gable of the retort-house, which was standing entirely

unprotected, was blown down one Saturday afternoon by a terrific gale blowing from the east. It has since been rebuilt; and as we are now able to get a much better quality of bricks and lime than we were two years ago, I consider it a piece of much stronger work than it was originally. The coal-shed on the north side of the retort-house has been adapted as the machinery-room for generating electricity for electric lighting. In the fall of last year we got together as much of the roof material as had arrived, and put it together and placed it in position. We were thus enabled to cover in the two coal-stores and half the retort-house, leaving only the east gable and a portion of the side walls of the retort-house uncovered. It was fortunate we did this, as the season turned out a very wet one; and other parts of the building must inevitably have gone had they been without covering. The remainder of the retort-house roof has recently arrived, and we have placed it in position. As the gable is rebuilt, this block of buildings is now complete. The whole of the material for the purifying-house roof is at the works; but it is not proposed to erect that building until after the purifiers are placed in position. We have recommenced the erection of the retort-stack and the chimney-stack; and when completed the work of putting in the retorts and retort fittings will be proceeded with. We have sufficient material to complete two sets, which will enable us to go on making gas, which will supply the wants of the town until a considerable amount of mains is laid. The whole of the boiler fittings have arrived, with the exception of two dampers, and these we have made. The boilers are all fitted up and ready for work. The exhausters have now arrived, and seem in very good condition, considering their long exposure at Aliwal North. The condensers arrived in a very bad state—very much broken and battered about. I have, however, had them repaired and placed in position. They are now ready for work. The scrubbers are almost complete. The purifiers are all fixed and bolted together ready for riveting, and three of them are partly riveted. One of the lids is in progress as well, and nearly complete. The material for the centre-valve and the travelling crane is all on the ground, so far as I can judge without putting it together. The station meter is fixed and in position, and only requires to be connected to the gasholder and purifiers when they are ready. We are proceeding with the excavation for a tank 40 feet in diameter by 10 feet deep, which, for the time being, will have to suffice for both tar and liquor. A second tank may be constructed later for tar, if advisable. It is intended to make this tank with bricks and puddle. The tank for the 60-feet gasholder is complete and ready for the holder. We are now proceeding with the construction of the latter, the whole of the material for which is on the ground, so far as can be ascertained at present. The 16-inch governor, with all the connections belonging to it, and the 14-inch governor are fixed in position. Beyond laying the two trunk mains to the outside of the fence, we have not done any main-laying as yet. But as soon as we are in a position to supply gas, we shall push along the principal streets as quickly as possible; then as we go along the streets, we shall erect the lamps and light them up at the same time. There is still a large quantity of plant lying at Aliwal North, Kimberley, Bloemfontein, and Durban, some of which will be absolutely necessary before the town can be lit up. The coal mine has been standing for some time; but previous to being shut down, it was sufficiently developed to enable us to get as much as 50 tons per day if required, and this could very soon be increased to 100 tons per day. It has been reported to me that a good quality of bituminous coal has been found near the Vaal River, and as it is thought that the railway passing this point will be through to Johannesburg during next year, it will favourably affect the position and prospects of the Company. I have had no opportunity as yet of examining or testing the coal.

THE CHESTER TOWN COUNCIL AND ELECTRIC LIGHTING.

As briefly mentioned in the JOURNAL last week, the Chester Town Council, at their meeting on the 13th inst., adopted a recommendation of the Watch Committee to vote a sum not exceeding £20,000 for carrying out an electric lighting scheme. This decision was come to upon a report presented to the Committee by a deputation (consisting of Mr. Alderman Gilbert, Mr. Stevenson, and the City Surveyor) who had inspected the working of the electric light at Brighton, St. Pancras, Eastbourne, and Brompton. In the course of their report, the deputation said:

> Brighton represents two systems of distribution in operation in the same town—viz., the high-pressure alternating current, supplied by the Brighton and Hove Electric Light Company; and the low-pressure continuous current, supplied by the Corporation of Brighton. The high-tension electricity is distributed by means of overhead wires from the Brighton and Hove Electric Light Company's central station. The Company has existed for upwards of ten years, and the Town Council are somewhat indebted to them for working up the business, which, though steadily increasing, is stated to be at present an unprofitable one. The streets of Brighton are lighted by gas only. The gas-works belong to a Company—the charge for gas being 2s. 9d. per 1000 cubic feet; and it was observed that the majority of the tradesmen were not supplied with the electric light, and that the larger hotels provide the electrical machinery and appliances for their own lighting purposes. The Town Council of Brighton have borrowed £30,000 for a period of 30 years, and are now applying for a supplementary loan of £8500. The eventual total cost of the installation, including £7000 for the site of the station, is estimated at £42,000; and this sum, it is calculated, will supply 10,000 lamps—the usual average (5000) being lighted at one time. This station is now supplying 2500 lamps with current at 7d. per Board of Trade unit; the number lighted at one time being (say) 1200, and the largest single installation being 300 lights at the Alhambra. The Corporation cannot ascertain the profit or the loss; having had only two months' experience. An opinion was expressed that loss must arise on the present output; but that, if the maximum is supplied, profit may be made, as the only increased outlay will be in the direction of wages, fuel, &c. Coal costs at Brighton 22s. per ton; the best Welsh steam coal being preferred. The Mayor and members of the Council consider the low-pressure continuous current and storeage battery system the best for compact areas (1¼ miles the greatest distance); and therefore for Chester they advise keeping the Order in the hands of the Corporation, having great faith in the future of the electric light. The cost of the electric light, calculated lamp against lamp, is double that of gas; but greater illumination is obtained. The consumers' expectation is met by giving a better light, besides improved conditions of health and cleanliness. Smaller fire risks, clearer atmosphere, and non-destructive effects are also advantages claimed for the electric light against gas. It will be observed that the coal cost at Chester is but one-half the price paid in the towns visited; and this fact, coupled with information derived from various returns, documents, pamphlets, and estimates, demonstrates that Chester is well circumstanced and favourably situated for an installation of the electric light.

Alderman Johnson moved the adoption of the recommendation; and the motion was seconded by Mr. Cunnah. Alderman Gilbert remarked that the Town Clerk (Mr. S. Smith) seemed to think that the new light would be pretty largely taken up in Chester; and he (Alderman Gilbert) only hoped it would be. But he feared the initial expenditure to the consumer would be prohibitive. At Eastbourne they paid 6 per cent. on the debenture stock, and very likely would soon pay interest on the ordinary stock. At Eastbourne they had had an experience of ten years with the electric light; and a Director of the Gas Company there told him that the gas had suffered little or nothing. At Brighton the electric light was being worked at a very serious loss, because there was a competing Company. An authority at Brighton had prepared a written statement on the subject; and although he was concerned in private company promoting, he advised the Corporation to keep the matter in their own hands. Mr. J. Jones asked whether it was competent for the Council to renew the powers for another term, and how long the powers lasted. The Town Clerk replied that they came into operation in August next; but there was no such thing as the powers running out. If nothing was done before the 7th of August, it was competent for any company to approach the Board of Trade, and say, "The Corporation have not complied with their Order, so we apply for power to do it." Mr. Churton lamented the want of pluck displayed by the Corporation. He had frequently heard the lessons taught by not getting possession of the gas and water works. Over and over again it had been asked "Why don't you buy the gas-works? Why don't you buy the water-works?" and now they were afraid of taking the electric lighting into their own hands. From the first he had been in favour of the Council adopting the scheme. Of course, it was open to the Corporation to hand over the work to contractors; but this would be very unsatisfactory. They must face the question boldly. No doubt the expenditure was great; but the benefit would be equally great. They could not expect to make a profit to begin with; but when the light became better known, they would find it an enormous advantage to the city. Mr. T. Browne said he was as anxious as Mr. Churton to have the electric light, and to see it in the hands of the Corporation; but the matter ought to have due consideration. Mr. Cartwright remarked that, if the electric light was to be the light of the future, the effect would be to wipe out the gas-works. ("No, no.") Well, he asked, why not? If it did not wipe out the gas-works, they would be putting a double expense upon the consumers; for if they meant to say that some of the consumers were to have the electric light as well as gas, this would be putting an extra taxation upon them. The Gas Company had property which he thought might be used as a central station; and why should they not join with them in utilizing the two powers? He thought the Gas Company would readily meet the Corporation upon the matter; and he proposed that negotiations be entered into with them, with a view of utilizing their works for an electric light station. This proposition was not seconded. Mr. W. Brown urged that the Corporation had already delayed too long, and were now on the margin of the term of their Provisional Order. He was in favour of their undertaking the lighting themselves, and spending what he considered the comparatively small sum, for such a boon, of £20,000, even if it did involve a loss of £1000 for the first few years. Everyone would benefit by the electric light; and the time would come when they would secure all the profits, as in Manchester, where the rates were enormously diminished by the profits from the gas-works. Alderman H. T. Brown contended that the recommendation of the Committee was not at all borne out by the report which preceded it. He said he understood that, if there was one part of the community in Chester more anxious for the light than another, it was the tradespeople; and it was startling to find in a place like Brighton, with its attractive shops and the extent of its trade, and with two powers furnishing the electric light, that the tradespeople should not have adopted it in their establishments. He argued that the electric light was not wanted for street lighting in Chester, where the principal streets were at present as well lighted by gas as those of any town need be. As the light was not wanted by private residents, and as there was no need to tax the ratepayers for improved street lighting, the sole parties by whom the light was required were the tradesmen. It was important to consider whether, under the present circumstances, the Council would be justified in taxing the whole city for the private purposes and advantage of the tradespeople; because there was no doubt that for many years to come the electric lighting must entail loss, whether taken in hand by the Corporation themselves or by outsiders. It required most careful consideration before they launched out into an undertaking involving an expenditure of £20,000 for what was really a luxury. After a few remarks from Alderman Gilbert, the recommendation was adopted by 18 votes to 4.

The Kirkleatham Water Supply.—It is reported that Messrs. Walker, Maynard, and Company, of the Redcar Iron-Works near Middlesbrough, have served formal notice on the Kirkleatham Local Board that, in the event of the Board taking the water supply of the district into their own hands, the firm will hold them responsible for all damage sustained by reason of the Local Board putting in force any of the clauses of the Public Health Act of 1875 relating to water supply. The claim of the firm will, on the lowest estimate, amount to £22,000, and is based on the fact that they have a statutory right at present to a continuous supply of water from the Stockton and Middlesbrough Water Board at 3d. per 1000 gallons; and the damage is calculated on the loss which will be sustained by having to provide a new supply of water, or to pay the enhanced charges for water under the Local Board's proposed scale.

METROPOLIS WATER SUPPLY.

The Proposed Royal Commission.

At the Meeting of the London County Council last Tuesday, the Chairman (Sir J. Lubbock, Bart., M.P.) said he had received from Mr. Ritchie, the President of the Local Government Board, the following letter: "Sir,—Referring to the correspondence which has taken place between the London County Council and Her Majesty's Government, I have to intimate to you, for the information of the Council, that Her Majesty's Government have resolved to advise the appointment of a Royal Commission to inquire 'whether, taking into consideration the growth in the population of the Metropolis, and the districts within the limits of the Metropolitan Water Companies, and also the needs of the localities not supplied by any Metropolitan Company, but within the watersheds of the Thames and the Lea, the present sources of supply of these Companies are adequate in quantity and quality, and, if inadequate, whether such supply as may be required can be obtained within the watersheds referred to, having due regard to the claims of the districts outside the Metropolis, but within these watersheds, or will have to be obtained outside the watersheds of the Thames and Lea.'" Sir John remarked that the proposal contained in the letter was substantially in accordance with the suggestion made to the Government by the Council; and he was sure the decision of the Government must be satisfactory to them all. The letter was ordered to be recorded on the minutes, and was referred to the Special Committee on Water Supply.

The Quality of the Water Last Month.

The returns furnished to the Registrar-General by the London Water Companies as to the water supply of the Metropolis during the past month, show that the average daily supply was 177,450,133 gallons, as compared with 181,980,410 gallons in the corresponding month of 1890; being at the rate of 29·2 gallons per head of the population. Of the entire bulk of water sent out, 88,909,053 gallons were drawn from the Thames, and 88,541,080 gallons from the Lea and other sources. Reporting upon the quality of the supply, Dr. E. Frankland said: "Taking the average amount of organic impurity contained in a given volume of the Kent Company's water during the nine years ending December, 1876, as unity, the proportional amount contained in an equal volume of water supplied by each of the Metropolitan Water Companies and by the Tottenham Local Board of Health was: Kent, 0·8; East London (deep-well), 0·9; Tottenham, 1·5; Colne Valley, 1·7; Chelsea, 3·5; New River, 4·1; East London (river supply), 4·3; Lambeth, 6·1; Southwark, 6·3; West Middlesex, 6·4; and Grand Junction 6·5. The water abstracted from the Thames by the Chelsea Company was of greatly improved quality as compared with the November supply; but that delivered from the same source by the West Middlesex, Southwark, Grand Junction, and Lambeth Companies was, in every case, of much worse quality than the supplies sent out by the same Companies in November. The excessive floods in the Thames Valley rendered it very difficult for these Companies, who have but small storeage at their command, to send out water fit for dietetic use. The Southwark Company's water was opalescent from finely-suspended clay, which was not removed by subsidence or filtration. The remaining Thames waters were efficiently filtered before delivery. The water taken chiefly from the Lea by the New River and East London Companies, though much better than the four inferior Thames waters, was not equal in quality to the Chelsea Company's supply. The water was, in both cases, efficiently filtered. The deep-well waters of the Kent, Colne Valley, and East London Companies, and of the Tottenham Local Board of Health, were, as usual, of excellent quality for dietetic purposes; and the Colne Valley Company's water, having been softened before delivery, was rendered suitable for washing. The Tottenham and East London waters were slightly turbid from minute particles of rust of iron. The others were bright and clear. Seen through a stratum 2 feet deep, the Kent, and Colne Valley waters were clear and colourless; the Tottenham and East London (deep-well), slightly turbid and colourless; the Chelsea, New River, and East London (river supply), pale yellow and clear; the West Middlesex, Grand Junction, and Lambeth, yellow and clear; and the Southwark, pale brown and opalescent."

OPPOSITION TO THE BIRMINGHAM CORPORATION WATER SCHEME.

A Meeting of gentlemen opposed to the scheme of the Corporation Water Department for bringing a supply from Wales, was held at Birmingham last Wednesday. Mr. S. Lloyd presided; and after he had made a few opening remarks, Mr. B. Shepherd (who demanded the poll at the recent meeting of ratepayers) addressed those present. He said that Sir Thomas Martineau had admitted that in the figures which the Water Committee laid before the Council, both on the question of demand and supply and also on the subject of finances, they had had to deal with estimates for the future, and had to indulge in a certain amount of prophecy; and such prophecy and undue speculation he (Mr. Shepherd) thought the ratepayers of Birmingham ought not to be made to support. The wasteful expenditure proposed would, in his opinion, amount to £10,000,000. He was thoroughly satisfied, moreover, whatever might be said against it, that the conduit would have to pass through a mining district in which, on account of the thicker seams of coal met with, there would be much greater danger of subsidence than in the country between Birmingham and Derbyshire, to which Sir Thomas Martineau took objection for the same reason. Besides this, the proposed collecting-ground consisted of sheep-runs and a lead mine; and it was well known that immediately water was stored in reservoirs, and became subject to the light and the air, deterioration and vegetation occurred. The Chairman of the Southwark and Vauxhall Water Company, at the recent meeting of the shareholders, referring to the proposal that water should be obtained from the same district for the supply of the Metropolis, said that the water would be of "a dirty brown colour," and that the long conduit might be blown up by disaffected working men, or destroyed by enemies in case of war. That dirty brown water was what the Birmingham Water Committee proposed to give the inhabitants for £7,000,000. But what could they get for £500,000? Mr. Gray, the Corporation Water Engineer, had stated that the water-mains could be duplicated for that sum; and if duplicate pipes were supplied, he (Mr. Shepherd) believed nearly five times the present population might be supplied with drinking water from the present wells, which Sir Thomas Martineau himself had described as giving "a water which is the very best that we have supplied to the inhabitants." Mr. G. J. Whitfield remarked, on the question of the cost of the scheme, that it was impossible to estimate precisely a large job in which there would be 80 miles of cut-and-cover work, without knowing the nature of the ground which would have to be traversed. He should not be surprised if the estimate had not come out roughly at more than £7,000,000, and that £200,000 was knocked off to throw dust in the ratepayers' eyes. The present debt of Birmingham was nearly £10,000,000; and £2,500,000 of it was entirely unproductive of revenue. If the water scheme cost more than was expected, they would be in debt to the extent of £20,000,000. There was not the slightest doubt that the public officials of Birmingham had been fired into exultation by the example of the City of Liverpool in taking the water of the Vyrnwy. But Liverpool was more modest. Their scheme was only to cost £2,500,000, though he believed the expenditure had been rather more than £3,000,000. Liverpool, however, had more than the resources of Birmingham. They had nothing to tax but the houses and land; while Liverpool had shipping as well. There was already a first mortgage upon the water-rents; and the annuitants (as they were called) had determined to fight this new scheme because the Corporation wanted to throw them on to the rates. Mr. W. Blakemore next addressed the meeting. He said that, after a careful study of the existing state of affairs, the story of a probable shortness of water was a bogie. As a mining engineer, he could assure the ratepayers that the coal-fields through which it was proposed to carry the Welsh water were by no means worked out, and that beyond them there were other areas beneath which it was pretty certain there was coal, which would eventually be worked. He urged those present not to neglect the supplies which Nature had provided them with, which only required boring beneath the red sandstone to secure. The Chairman moved the appointment of a Committee, with power to add to their number, "to oppose the scheme, and to adopt such measures as may be found desirable to carry out the wishes of the meeting." The motion was unanimously carried, as was also the following: "That a petition, on behalf of the citizens of Birmingham, be presented to the Parliamentary Committee in opposition to the present scheme, and Mr. J. A. Bright, M.P., be requested to take charge of and present the same." An appeal for subscriptions was afterwards made; and it is stated that a considerable sum of money had been promised, with offers of more if required.

STOCKTON AND MIDDLESBROUGH WATER UNDERTAKING.

The Kirkleatham Water-Mains Arbitration.

In the JOURNAL last week p. 120), we briefly noticed the arbitration proceedings to determine the amount to be paid by the Kirkleatham Local Board to the Stockton and Middlesbrough Water Board for their mains and the privileges of water supply in the Kirkleatham district. The award has now been made; and under it the Local Board are to pay the Water Board £25,424—both sides paying their own costs and half the costs of the award. It may be interesting to point out that the only previous purchase, as far as we are aware, under this dismemberment clause, of "pipes, fittings, and other apparatus," was that in which the Wakefield Rural Sanitary Authority took over the pipes in their district from the Wakefield Corporation. The award in that case was for an amount equal to the estimated first cost of the pipes, &c., as laid in the ground, without any addition for right of supply and goodwill; while in the present instance, it appears to have been based upon the contention of the Water Board that they were parting with a "portion of the undertaking," including goodwill, &c., which they had previously acquired from the Water Company. It is curious to note that, though the two awards (founded upon similar sections in two Acts of Parliament) are apparently contradictory, yet they are both essentially just. At Wakefield, the Rural Sanitary Authority agreed to take water from the Corporation at a fair price; and therefore the latter have not in any way suffered damage by the dismemberment. Here the Kirkleatham Local Board intend to obtain their water from the Cleveland Water Company; and so the Water Board will lose a customer, and consequently the profit they have hitherto derived from the consumption of water within the severed district. Probably this was the view taken by the Arbitrator, whose award may be regarded as substantially fair. It should be mentioned, in correction of our paragraph last week, that the Arbitrator was Mr. Henry Law; and that Mr. Bagallay appeared with Mr. Balfour Browne, Q.C., for the Water Board. Among the witnesses called for this body, the name of Mr. E. K. Burstal, of Messrs. Stevenson and Burstal, of Parliament Street, Westminster, should have been included.

Welsh Rivers and English Water Schemes.—In the course of the reply of the Rev. O. A. Nares to the letters of Members of Parliament on this subject (*ante*, p. 121), he said, referring to Lake Vyrnwy: "Beyond the expenditure incurred by the formation of the reservoir in Wales, the county of Montgomery has secured no advantage from the water-works." A correspondent of a Montgomeryshire paper, in answer to this, points out that the Liverpool Corporation have already been assessed on that property at a sum greater than the value of the whole of Kerry parish. The ratepayers of Llanfyllin Union will now be relieved to the extent of about 4d. in the pound, and in all probability the County Council will, before two years' time, revise the county rate basis; and thus every ratepayer in the country will be the better to the extent of about 1d. in the pound.

NOTES FROM SCOTLAND.

From Our Own Correspondents.

Saturday.

The Edinburgh and Leith Gas Commissioners have this week done a service to the gas industry in Scotland, for which they must be inwardly thanked by all who are interested in gas undertakings. Objection was taken by the Surveyor of Income-Tax to their return for the year ending in May last, in respect that the Commissioners had not returned as part of their assessable income the amount of law and parliamentary expenses which they had paid during the year. These amounted to £2700; and the duty being about £70, the question was considered to be worth getting the opinion of the higher authorities upon. Accordingly, appeal was taken to the Income-Tax Commissioners for the district. The case was heard yesterday. The Commissioners were represented by the Treasurer (Mr. Gill) and the Clerk (Mr. Jack); and the finding of the Commissioners was against the opinion of their Surveyor, except upon a small sum of £200 paid as compensation to Messrs. Mackay and Co. for the pollution of the well of St. Margaret's brewery. Upon this subject the Tax Commissioners favoured the establishment of a fund to meet such claims; or at least they indicated an opinion that had the sum been taken from such a fund, it would not have been liable to tax. On the general question, they were clearly of opinion that outlays on legal and parliamentary charges which are incurred in the protection of the position of the undertaking are not taxable. It would be difficult to see how they could be. Money so expended is really and truly depreciation; in fact it is more, because it is spent to enable the undertaking to earn more in future. To look at it in another way, it would be hard to distinguish such expenditure from abnormal outlay upon the office staff, supposing it should require to be augmented for some necessary purpose in any one year. Certainly expenditure in that line is not profit; and expenditure upon lawyers, either at home or in London, cannot be classed as profit either. There is this further consideration, that all such outlay by public bodies is taxed in the pockets of those to whom it is paid; and to have charged the Gas Commissioners in this instance, would have meant that the same sum would have paid income-tax twice in one year. This latter remark applies also to the £200; for it should have been taxed in the hands of Mackay and Co. who received it, and not of the Gas Commissioners who paid it. The Surveyor of Taxes proposed to lay down a principle; and the Gas Commissioners by their action, have prevented him. Of course, it is open to the Surveyor to appeal to the Court of Session; but in face of the very clear opinion which was expressed by the Tax Commissioners, before such a step is taken very serious consideration will have to be bestowed upon the subject, and there is every likelihood that it will not be taken.

The Committee of Management of the Arbroath Gas Corporation have resolved to insure the gas-works in a sum of £10,230. Hitherto they have only been insured for about £1000. The Committee also had before them a more serious question, in the shape of the pressure which exists in the gas-mains in different parts of the town—the Manager's tests having shown that it varied from 6-10ths in the lower parts to 18-10ths in the higher parts. This is too great a difference of pressure to be passed over; but a decision as to what the Committee are to do, was left over until Mr. Carlow makes further tests both by day and night. It must be remembered that the Arbroath Gas-Works are situated in about the highest part of the town; and a difficulty has always been experienced in maintaining an equality of pressure at the different levels of the town. About three years ago, the Corporation rejected a proposal by Mr. Carlow, backed up by Mr. Mitchell and Mr. Foulis, for the introduction of a new independent main from which to supply the lower levels; and contented themselves with the addition of two new ovens to the retort-bench. Their mistake at that time is now coming home to them. They were then in a better position to afford expenditure upon their works than now; but as the proposed outlay upon the new main was only a few hundred pounds, they may even now be able to meet it. They must do something to put the pressure upon a proper footing; because the great inequality which has been revealed is very unfair to a portion of the community and prejudicial to the Corporation.

There is better news from Inverness this week. The Corporation Water and Gas Committee met on Monday, and considered a modified proposal by the Gas Manager (Mr. Thomson), with reference to the required extension of the gas-works. Mr. Thomson suggested that, by leaving over the construction of a second lift in the new gasholder till it was required, which would probably be six years, the cost of the extensions might be brought down from £9800 to £7500. The Committee, greatly to their credit, declined to consider the modified scheme; and resolved to recommend the Police Commissioners to go on with Mr. Thomson's original proposal. What helped them to this decision more than anything else was a letter which one of their number stated he had received from an English firm who had had large experience in the laying down of electric lighting installations, in which it was said that the cost of an electric lighting main from Foyers to Inverness—18½ miles—would be from £12,950 for 250-horse power, to £37,800 for 500-horse power. This was too much for the Water and Gas Committee; but that other peculiar body, the Electric Lighting Committee, who seem to be practically one man—Bailie Jonathan Ross—met on Wednesday to consult with the Resident Engineer for the Caledonian Canal as to the taking of water power from the canal. The Engineer suggested several points of difficulty, chiefly apparently on the details of construction, which might have been overcome; but someone started a difficulty which was not so easily disposed of—viz., as to how the flow of water could be maintained in winter if there were large masses of ice in the canal. This very difficulty was very clearly pointed out in these "Notes" on Aug. 18 last, the week after the electric lighting proposal was first made. I presume the promoters were too stiff-necked to accept advice except from the engineers they consulted; and that it was only when the practical mind of the Canal Engineer brought the matter up, that they listened to it. The Committee could do nothing; and so they asked their Consulting Engineer and the Canal Engineer to "investigate and consider the matter." These gentlemen may investigate and consider as long as they please; but unless they are prepared to abolish snow and ice in the Highlands, they will never be able to satisfactorily light Inverness with electricity derived from water power.

The gas explosion on the Central Railway Works, Anderston Cross, Glasgow, on the morning of Dec. 3 last, through which personal injuries were sustained by three men, named Patrick M'Govern, George Henry Moulson, and James Devanny, has given rise to three legal actions for damages in the Glasgow Sheriff Court, which bid fair to be of very considerable interest. They had been raised at the instance of the three men named against the Caledonian Railway and Messrs. Charles Brand and Son, the contractors for the works. M'Govern states that at the moment of the explosion he was walking along the street towards his place of employment, when he was blown up into the air, and fell heavily to the ground; and that he has received a severe shock and other bodily injuries. He alleges that the explosion occurred through the interference of the defenders with the main gas-pipes belonging to the Gas Corporation; through having removed the soil from underneath them for about two lengths of piping, and thereby exposing two joints by which the several lengths of pipe were connected; through the pipe having been damaged by the said interference, allowing a large quantity of gas to escape into a covered cutting or tunnel running across Main Street; and through a workman of Charles Brand and Son having entered this cutting with a naked light. The pursuer also alleges that the provisions of the Glasgow Central Railway Act were not complied with, and that the defenders' operations were a nuisance and fraught with danger. In answer, the defenders deny that the explosion was occasioned through their interference with the gas-pipe or through any fault of theirs. They also aver that the works executed were in accordance with plans approved of by the Corporation of Glasgow, and were executed to their satisfaction in accordance with the said Act. In the actions at the instance of Moulson and Devanny, they aver that the work was being carried on carelessly and recklessly; and that the defenders Charles Brand and Son failed to take proper precautions for their safety, or to have the cutting properly ventilated or inspected. The record in the three actions was closed before Sheriff Spens yesterday (Friday); and they will come on for debate very shortly.

Another law case has cropped up this week in connection with a gas-supply undertaking—one, however, in which the judge has given his decision. The pursuer in this case, which was raised before Sheriff Muir, in the Airdrie Sheriff Court, was the father of a boy, Peter Reid, 4½ years of age, who met with an accident in Bank Street, Coatbridge, in November, 1890, which was alleged to have been caused through the fault of the defenders, the Coatbridge Gas Company, the damages sued for being £50. The Sheriff has found that the accident was not caused through any fault of the defenders; and therefore assoilzes them from the action, and finds them entitled to expenses.

The town of Kilbirnie, in Ayrshire, gets its supply of gas from Messrs. W. and J. Knox, who are the proprietors of an immense linen thread factory which provides a large proportion of the townspeople with labour. Some time ago Messrs. Knox found it to be absolutely necessary to provide an additional supply of light, and they gave the fullest consideration to the notion of introducing the electric light; but in the end they concluded that, on the score both of convenience and economy, it would be most prudent to extend the gas-works. In this connection, they have lately had finished a new gasholder which is 40 ft. in diameter by 15 ft. in depth, and contained in a cast-iron tank; and along with its completion new pipes, to the extent of about 600 yards, has been laid in the town and works. Messrs. W. Brodie and Co., of Paisley, were the contractors; and it is interesting to know that the first holder ever erected by Mr. Brodie on his own account was at these same works, about thirty years ago, within which period the gas supply of Kilbirnie has been at least quadrupled.

It is matter for regret that the experiment of hiring-out gas-stoves in Kilmarnock by the Corporation Gas Committee has not been attended with the amount of success that has been reported from scores of other towns up and down the kingdom, with the result that the Committee resolved, a few weeks ago, to close up the show-room which was started in one of the public thoroughfares of the town last spring, and to transfer the stock to the office at the gas-works. At the last meeting of the Town Council, when the Committee submitted their report, Bailie M'Graw expressed himself in very severe terms on the stove-hiring enterprise. He considered that the fact of closing the shop was an indication that all along they had simply been wasting their time and frittering away the ratepayers' money. Ex-Bailie Brown (Convener of the Gas Committee) stood up in defence of the action taken by the Committee. They had, he said, 97 stoves hired out, the revenue from which was £48 18s., something like 10 per cent. on the cost. As far as the stock was concerned, it belonged entirely to the firms that supplied the stoves, the Committee not being responsible for them. It transpired in the course of the discussion that there had been a profit of £15 for gas consumed in the stoves that had been hired out. It was also stated during the discussion by Bailie M'Graw that the Committee's report had been "doctored"—a statement which was strongly resented by Convener Brown, on behalf of Mr. Fairweather (the Gas Manager), who had drawn up the report. The matter was allowed to drop on the understanding that it would come up again at the next meeting of the Town Council.

The Glasgow pig iron market has been flat during the past week; but Scotch warrants have remained unaltered in price at 47s. per ton cash, at which there were buyers at the close yesterday. A large amount of business has been done in Cleveland and hematite iron at lower prices, which at the close yesterday were, respectively, 37s. 5d. and 47s. 1½d. per ton cash buyers.

[In the paragraph in last week's "Notes" dealing with the Glasgow gasholder contract, the point of one of the sentences in the letter of the "Embryo Town Councillor," there referred to, was destroyed by the omission of a negative. The sentence, which commences at the end of the 15th line from the bottom of the paragraph, should have read: "The successful offerer can give *no* more guarantee for the fulfilment of the contract than the other, who was £1200 lower," &c.—Ed. J.G.L.]

CURRENT SALES OF GAS PRODUCTS.

LIVERPOOL, *Jan.* 23.

Sulphate of Ammonia.—After a slight pause in the early part of the week, the market has increased in firmness, and an improved demand is noticeable. There are now buyers at £10 11s. 3d. to £10 12s. 6d. at the various ports; and there is but a moderate quantity offering, which, considering the time of the year and the state of the weather, is somewhat remarkable. While the above figures, of course, indicate a fair advance on the December quotations, the relative position of sulphate towards nitrate is in no way altered, since nitrate has advanced almost at the same rate as, and simultaneously with, sulphate. Hence the same anomaly still exists between the two commodities; and the arguments previously put forth in the JOURNAL continue in force. Sulphate, according to these reasonings, remain at too low a figure; and a further advance in nitrate, which is not at all improbable, must bring this fact home forcibly to the consumers of nitrogenous material. The quieter tone referred to above seems again to have created a hallucination as to the probability of an easier market; and many consumers are holding off in the hope of cheap purchases. But, considering the reduction of the stocks, owing to very heavy shipments, the small quantity on the market, and the impending requirements, it may be predicted that there will be disappointment in store for those who wait for a lower range of values in the near future.

LONDON, *Jan.* 23.

Tar Products.—Very little business is being done; and tar distillers are overflowing with stocks. In many instances, they have resorted to burning the creosote and common oils. A little business is reported in benzol; and, on the whole, their position is improved. In this improvement, solvent naphtha is also participating. Anthracene keeps extremely dull, with no inquiry; and, as makers are now stocking, the price is likely to be lower. Pitch is moving off freely, with an excellent demand both for prompt and forward delivery. Prices are: Tar, 19s. Pitch, 33s. 6d. Benzol, 90's, 2s. 2½d.; 50's, 1s. 9d. Toluol, 1s. 3½d. Solvent naphtha, 1s. 2d. Crude benzol naphtha, 30 per cent., 10½d. Creosote (nominal), 1d. Crude naphthalene, 35s. Crude carbolic, 60's, 1s. 1½d.; crystals, 5½d. Cresol, 8½d. Anthracene, 30 per cent. (nominal), "A" quality, 1s.; "B" quality, 8⅜d.

Sulphate of Ammonia.—A distinctly better feeling obtains in this market. A good deal of business is being done; and makers' stocks are remarkably low, having regard to the production. Buyers, however, "hang off" for forward business; and so far will not pay the advance asked for by makers. Prices paid during the week have averaged about £10 10s., less 3½ per cent. Gas liquor (10 oz.) is quoted at 6s. 9d. to 8s. 3d. per ton, according to position.

COAL TRADE REPORTS.

From Our Own Correspondents.

Lancashire Coal Trade.—There is practically no change to report in the coal trade of this district. For the better qualities, there is still rather a pressure of demand; and engine classes of fuel continue to move off without difficulty, with a slight advance maintained upon late rates so far as the medium and inferior sorts are concerned. But common round coals, except when they are drawn upon for house fuel requirements, remain in only moderate request for iron-making, steam, and general manufacturing purposes. The general tone of the market as regards prices continues very steady; and at the pit mouth, quotations average as under: Best Wigan Arley, 12s. 6d.; Pemberton 4-feet and second qualities of Arley, 10s. 6d. to 11s.; common house coals, 9s. to 9s. 6d.; steam and forge coals, 8s. to 8s. 6d.; burgy, 6s. to 6s. 6d., with some special sorts 7s.; best slack, 5s. to 5s. 6d.; medium, 4s. 3d. to 4s. 9d.; and common, 3s. 3d. to 3s. 9d. per ton. For shipment, there is a fairly active inquiry; and, in some instances, difficulty has been experienced in obtaining prompt delivery of quantities, with the result that prices temporarily have rather stiffened, and, delivered at the Lancashire ports, steam coal has readily fetched 10s. to 10s. 6d.

Northern Coal Trade.—There has been a slight easiness in the coal trade during the past few days—more especially in steam and household coal. Best Northumbrian steam coal is quoted from 10s. to 10s. 6d. per ton f.o.b., according to place of shipment. Most of the collieries have tolerably full work; but for second-class coal and for small steam coal, the demand is decidedly weaker. Gas coal is firm, and the demand for the past few days has been very heavy; the day consumption of gas having in several places shown a large increase. The price varies from 9s. to 10s., f.o.b. and less discount; but for contracts over the shipping season which are now under negotiation, a rather lower price may perhaps be taken. Shipments of this class of coal to London are beginning to fall off; but there is an increase in the tonnage sent to the Mediterranean. Bunker coal is rather easier, though heavy quantities are being shipped at West Hartlepool in steamers that are being put into the American grain trade. The price of bunker coal varies from 8s. 6d. for unscreened up to about 11s. 9d. for the best Durham screened. Manufacturing coals are quiet, with a somewhat limited consumption; strikes having interfered with the working of some large local establishments. In coke, there is a good demand for best blast-furnace qualities; and from 16s. to 16s. 6d. per ton is the price for f.o.b. supplies. Gas coke is dull; and it is said that as low as 8s. to 8s. 6d. per ton is being locally accepted—a price that would set against the lower cost of coal to gas companies in some degree.

West of Scotland.—The coal trade in the West of Scotland shows little alteration. A fair business is passing for prompt deliveries; and for these the rates current at the end of the year are obtainable. The men are not working well, however, and the output is being easily cleared off. There has been no forward business done as yet; foreigners holding off until prices take some definite shape. The following are the quotations per ton at Glasgow Harbour: Splint, 9s. 6d.; main coal, 8s. 6d.; steam, 10s. to 10s. 6d.; ell, 8s. 9d. to 9s.—all f.o.b. The increase in shipments for this year is 72,052 tons. It is anticipated that the Lanarkshire coal-masters will early next month intimate to the miners a reduction of 10 per cent. in the rate of wages.

Messrs. C. Wilson and Sons' London show-room is at No. 76, Queen Street, Cheapside, not in Queen Victoria Street, as announced in the last number of the JOURNAL.

A New Water Reservoir for Douglas.—Considerable progress is being made with a reservoir which the Douglas Town Council are constructing at Kerroodhoo, four miles from Douglas. This work, which is estimated to cost about £12,000, was undertaken by the Council soon after their purchase of the water-works; and its cost was included in the loan raised at that time. The reservoir is about 600 yards long, and has a capacity of 52 million gallons.

The Bilston Gas Company Fined.—At the Bilston Police Court recently, a summons was heard, in which the local Gas Company were charged with cutting up the roadway on two bridges belonging to the Great Western Railway Company, for the purpose of laying down gas-mains, without giving the Railway Company the statutory twenty-four hours' notice. It was contended for the defence that the Bilston Township Commissioners, and not the Gas Company, were responsible for the breaking up of the roads; and it was admitted that the notice had not been given, but it was held that it was not necessary. At the adjourned hearing last Tuesday, the Stipendiary decided that the bridges and roads on them were the property of the Railway Company, and that notice should have been given. He imposed a fine of 20s. and costs upon the Gas Company in respect of each bridge.

Great Wigston Gas Company.—The large augmentation in the consumption of gas which has been going on for the last eight or nine years at Great Wigston was fully kept up in the year just closed; the increase being 2,260,000 cubic feet, or about 15 per cent. The make of gas per ton of coal carbonized for the year was upwards of 11,000 cubic feet; the quantity sold per ton being more than 10,000 cubic feet. The two new beds of retorts, with regenerators designed by the Manager (Mr. J. A. Harris), which have been at work the whole of this season, have exceeded the expectation of the Directors; the make of gas per day from the 12 retorts, 22 in. by 15 in., and 10 feet long, being repeatedly over 100,000 cubic feet. We understand that this quantity could have been exceeded if required. It is intended to extend this system to the other retorts during the coming season.

GAS AND WATER COMPANIES' STOCK AND SHARE LIST.

(For Stock Market Intelligence, see ante, p. 151.)

Issue.	Share	When ex-Dividend.	Dividend or Div. & Bonus.	NAME	Paid per Share	Closing Prices.	Rise or Fall in Wk.	Yield upon investment.
£			p. c.	GAS COMPANIES.				£ s. d.
590,000	10	15 Oct.	10½	Alliance & Dublin 10 p. c.	10	16–17	..	6 3 6
100,000	10	,,	7½	Do. 7 p. c.	10	11¼–12½	..	6 0 0
300,000	100	2 Jan.	5	Australian (Sydney) 5 % Deb.	100	105–107	..	4 13 5
100,000	20	27 Nov.	8	Bahia, Limited	20	12–14	..	11 8 6
200,000	5	12 Nov.	7½	Bombay, Limited	5	6½–7	..	5 7 1
40,000	5	,,	7½	Do. New	4	4¾–5¼	..	5 14 1
380,000	Stck.	13 Aug.	12½	Brentford Consolidated	100	210–220	..	5 11 4
125,000	,,	,,	9½	Do. New	100	157–162	..	5 14 2
220,000	20	16 Sept	11½	Brighton & Hove Original	20	40–42	..	5 9 6
888,500	Stck.	16 Sept.	5	Bristol	100	98–103	..	4 17 1
320,000	20	15 Oct.	11½	British	20	42–44	..	5 2 3
50,000	10	28 Aug.	11½	Bromley, Ordinary 10 p. c.	10	18–20	..	5 15 0
50,380	10	,,	8½	Do. 7 p. c.	10	13–15	..	5 13 4
328,750	10	—	—	Buenos Ayres (New) Limited	10	6–7	+½	—
200,000	100	2 Jan.	6	Do. 6 p. c. Deb.	100	92–97	+2	6 3 9
150,000	20	13 Aug.	8	Cagliari, Limited	20	25–27	+1	5 18 6
550,000	Stck.	15 Oct.	13⅜	Commercial, Old Stock	100	240–250	..	5 10 0
165,000	,,	,,	10¾	Do. New do.	100	190–195	..	5 10 3
130,000	,,	30 Dec.	4½	Do. 4½ p. c. Deb. do.	100	117–122	..	3 13 9
800,000	Stck.	30 Dec.	13	Continental Union, Limited	100	220–230	−5	5 13 0
200,000	,,	,,	10	Do. 7 p. c. Pref.	100	185–195	..	5 2 7
75,000	Stck.	16 Sept.	10	Crystal Palace District	100	190–200	..	5 0 0
486,090	10	15 July	10	European, Limited	10	19–20	..	5 0 0
354,060	10	,,	10	Do. Partly paid	7½	14–15	..	5 0 0
5,470,640	Stck.	13 Aug.	12*	Gaslight & Coke, A, Ordinary	100	216–221	−2	5 8 7
100,000	,,	,,	4	Do. B, 4 p. c. max.	100	95–98	..	4 1 7
665,000	,,	,,	10	Do. C, D, & E, 10 p.c. Pf.	100	248–253	..	3 19 1
30,000	,,	,,	5	Do. F, 5 p. c. Prf.	100	118–123	..	4 1 4
60,000	,,	,,	7½	Do. G, 7½ p. c. do.	100	172–177	..	4 4 9
1,300,000	,,	,,	7	Do. H, 7 p. c. max	100	152–157	..	4 9 2
463,000	,,	,,	10	Do. J, 10 p. c. Prf.	100	245–250	..	4 0 0
476,000	,,	,,	—	Do. K, 6 p. c. Prf.	100	147–152	+2	3 18 11
1,061,150	,,	11 Dec.	4	Do. 4 p. c. Deb. Stk.	100	110–114	..	3 10 2
294,850	,,	,,	4½	Do. 4½ p. c. do.	100	118–123	..	3 13 2
908,000	,,	,,	6	Do. 6 p. c. do	100	160–165	..	3 12 9
3,800,000	Stck.	12 Nov.	12	Imperial Continental	100	224–229	..	5 4 9
75,000	5	26 June	6	Malta & Mediterranean, Ltd.	5	4–4½	..	6 13 4
560,000	100	1 Oct.	5	Met. of Melbourne, 5p. c. Deb.	100	109–111	..	4 10 1
541,920	20	27 Nov.	6½	Monte Video, Limited	20	15–16	..	8 2 6
150,000	5	27 Nov.	10	Oriental, Limited	5	8½–9	..	5 11 1
60,000	5	30 Sept.	7	Ottoman, Limited	5	4–5	..	7 0 0
166,870	10	26 Feb.	2	Pará Limited	10	2½–3½	..	—
420,000	100	3 Nov.	6	People's Gas of Chicago—1st Mtg. Bds.	100	98–102	+3½	5 17 8
500,000	100	1 Dec.	6	2nd Do.	100	98–102	+4½	5 17 8
150,000	10	15 Oct.	10	San Paulo, Limited	10	10–11	−⅛	9 1 10
500,000	Stck.	28 Aug.	15½	South Metropolitan, A Stock	100	265–275	..	5 12 9
1,350,000	,,	,,	12	Do. B do.	100	222–227	..	5 5 8
200,000	,,	,,	13	Do. C do.	100	230–240	+5	5 8 4
700,000	,,	30 Dec.	5	Do. 5 p. c. Deb. Stk.	100	138–143	..	3 10 0
600,000	Stck.	16 Sept.	11½	Tottenham & Edm'nton, Orig.	100	—	..	—
				WATER COMPANIES.				
729,331	Stck.	30 Dec.	10	Chelsea, Ordinary	100	260–265	..	3 15 6
1,720,560	Stck.	15 Oct.	8	East London, Ordinary	100	206–211	..	3 15 11
544,440	,,	30 Dec.	4½	Do. 4½ p. c. Deb. Stk.	100	136–140	..	3 4 3
700,000	50	11 Dec.	8	Grand Junction	50	101–106	+2	3 15 6
708,000	Stck.	13 Aug	10½	Kent	100	268–273	−2	3 16 11
1,043,800	100	30 Dec.	9½	Lambeth, 10 p. c. max.	100	225–235	..	4 0 10
406,200	100	,,	7½	Do. 7½ p. c. max.	100	189–194	..	3 17 4
260,000	Stck.	30 Sept.	4	Do. 4 p. c. Deb. Stk.	100	120–123	..	3 5 0
500,000	100	13 Aug.	12½	New River, New Shares	100	335–345	..	3 10 4
1,000,000	Stck.	30 July	4	Do. 4 p. c. Deb. Stk	100	125–127	..	3 3 0
902,300	Stck.	30 Dec.	6½	S'thwk & V'xhall, 10 p. c. max.	100	149–154	..	4 4 5
126,500	100	,,	6½	Do. D 7½ p. c. do.	100	140–145	..	4 9 8
1,155,066	Stck.	11 Dec.	10	West Middlesex	100	245–255	..	3 18 5

* Next dividend will be at this rate.

Sale of Shares.—Last Wednesday, 15 shares in the *Sutton, Southcoates, and Drypool Gas Company* were sold by auction at Hull, at £15 11s. each.

The Colne Gas Managership.—In the JOURNAL for the 12th inst., we published, on the authority of a local correspondent, a statement to the effect that Mr. G. Dyson, a former member of the Colne Local Board, had been appointed Manager of the gas-works belonging to that authority. Our attention having been called to the matter by Mr. Henry Simmonds, F.C.S., the Gas Manager, we find, on inquiry, that the information was not correct; our correspondent having misunderstood the resolution of the Board. It seems that Mr. Simmonds, who had the charge of both Gas and Water Departments, finding that the duties of his office were increasing with the growth of the population, informed the Board that he did not feel comfortable under the greater responsibilities thus thrown upon him. If, however, the Board were of opinion that he should retain the supervision of both departments, he was willing to go on. It was decided to relieve him of one; and Mr. Dyson was appointed Manager of the water portion of the undertaking. The Board, being thoroughly satisfied with the work done by Mr. Simmonds, have not made any alteration in his salary by reason of the change.

The Water-Works and Gas Securities Company, Limited.—Last Friday, a motion on behalf of the International Trustees and Assets Debenture Corporation, Limited, to have the name of the Corporation removed from the register of the Water-Works and Gas Securities Company came before Mr. Justice Chitty. Mr. Farwell, Q.C., who appeared for the applicants, said they applied for 5000 shares in the Company on the faith of a statement that applications for 70,000 shares had been received; but it turned out afterwards that the great majority of these applications were forgeries, and the supposed applicants had their names removed. The Directors thereupon returned the money to the few *bonâ fide* subscribers, and the only persons remaining on the register were the present applicants. They were ready to undertake that, in the event of the Company being wound up before any further capital was issued, they would pay the same amount as if they remained shareholders. The motion had been mentioned before, and stood over for a further affidavit; it being suggested that the applicants were the promoters of the Company. But it appeared from the evidence that the promoters were the New Founders' Shares Syndicate Company; the present applicants having only undertaken the issue and underwritten 5000 shares. There were no creditors—nothing having been done; and no one, therefore, could be prejudiced by the order being made. In the result, his Lordship thought a sufficient case had been made out, that the applicants were not promoters, and he would have their names removed from the register, on the undertaking mentioned being entered in the order.

Reduction in the Price of Gas at Aldershot.—The Directors of the Aldershot Gas and Water Company announce a reduction of 2d. per 1000 cubic feet in the price of gas (from 3s. 6d. to 3s. 4d.), to take effect from the 1st inst.

The Proposed Purchase of the Sutton Coldfield Gas-Works by the Corporation.—This subject was again under consideration by the Sutton Coldfield Town Council last Wednesday. It was stated that at ward meetings which had been held on the question, the ratepayers present had been, on the whole, adverse to the purchase; but the Mayor, Alderman Walters, and other members considered that the opinion of ward meetings must not be taken as a correct gauge of the feeling of the inhabitants generally. A resolution was proposed to the effect that the proceedings in connection with the project be continued. A counter motion received the support of eight members against ten; and the resolution was afterwards carried by ten votes to six.

Para Gas Company, Limited.—In the report of the Directors of this Company to be presented at the ordinary meeting of shareholders next Thursday, they state that the revenue earned in the six months ending Sept. 30 last was unsatisfactory; the private consumers having taken less gas by reason of the serious fall in exchange, and the revenue from illuminations having also suffered from the same cause, as well as the uncertainty of the political future. Further than this, however, the returns have also been seriously affected by the fines which have been enforced by the Government, and which amount to no less than 25 per cent. of the amount received for the public lighting; and this in face of the fact that the illuminating power of the gas has been maintained at 15 instead of 10 candles, as called for. The existing contract having been prolonged for a further period of twelve months, alterations and repairs, causing increased expenditure, became necessary; and further repairs should, it is stated, shortly be taken in hand. But, while the Directors are anxious to meet all equitable requirements, the imposition of the fines already alluded to, and the irregularity of payments by the Government authorities, so hamper the financial position of the Company as to cause at times very considerable anxiety. Being conversant with the disturbed political position in Brazil, the shareholders may have probably anticipated some of the difficulties which have thus beset the Company; and they will no doubt appreciate the effect which so serious a fall in exchange as has taken place must have upon its financial position. One of the Directors (Mr. T. Rumball) visited Pará in May last, and remained until the first week in August; and the Directors believe that the results of this visit will be greatly advantageous to the undertaking. The Directors recommend the payment of the usual dividend on the preference shares on or about the 1st prox.; but they do not feel justified in recommending at present a dividend on the ordinary shares.

GWYNNE & BEALE'S PATENT GAS EXHAUSTERS AND ENGINES.

Telegrams: "GWYNNEGRAM LONDON."

GWYNNE & CO., TELEPHONE No. 2698.

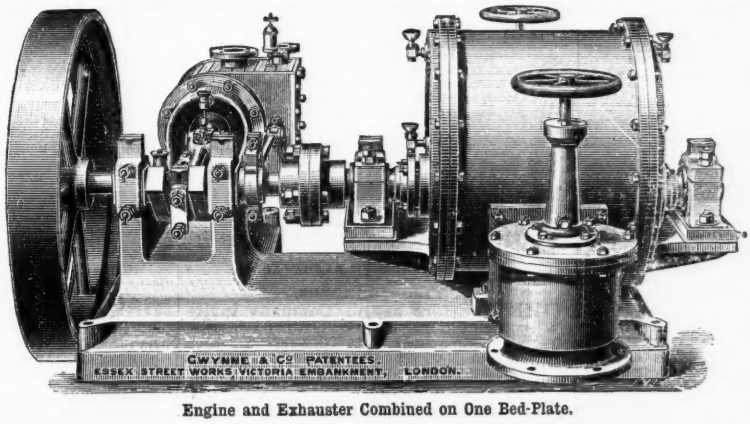
HYDRAULIC AND GAS ENGINEERS, ESSEX STREET WORKS, VICTORIA EMBANKMENT, LONDON, W.C.

Thirty-three Medals at all the Great International Exhibitions have been awarded to GWYNNE & Co., for Gas Exhausters, &c.

They have never sought to make price the chief consideration, but to produce Machinery of the very highest quality.

The result is that in every instance their work is giving the fullest satisfaction.

They have completed Exhausters to the extent of 30,000,000 cubic feet passed per hour, which are giving unqualified satisfaction in work, and can be referred to.



Engine and Exhauster Combined on One Bed-Plate.

GWYNNE & Co.'s Exhausters are constructed of large size to pass the required quantity of Gas at very slow speeds; the wear and tear being reduced to a Minimum.

Catalogues and Testimonials sent on Application.

Their Exhausters can be made, when desired, on their New Patent Principle, to pass Gas without the slightest oscillation or variation in pressure.

NO OTHER MAKER CAN DO THIS.

Makers of GAS-VALVES, HYDRAULIC REGULATORS, VACUUM GOVERNORS, STEAM-PUMPS for Tar, Liquor, or Water; PATENT SELF SEALING AND CLEANSING RETORT-LIDS AND MOUTHPIECES; CENTRIFUGAL PUMPS and PUMPING ENGINES specially adapted for Water-Works, raising Sewage, &c.

Also GIRARD and other TURBINES, HIGH-SPEED ENGINES, DYNAMOS, &c., &c., for ELECTRIC LIGHTING.

OXIDE OF IRON.

O'NEILL'S Oxide has a larger annual sale in the United Kingdom than all other Oxides combined. Purity and uniformity of quality guaranteed. Pamphlet, "How to Purchase Bog Ore," to be obtained on application.
Gas Purification and Chemical Company, Limited, Palmerston Buildings, Old Broad Street, London, E.C.
JOHN WM. O'NEILL, Managing Director.

GAS PURIFICATION AND CHEMICAL COMPANY, LIMITED.

ANDREW STEPHENSON, Agent.
Please address all communications to the Company, as above.

ANDREW STEPHENSON, Agent for BRIN'S OXYGEN COMPANY, Limited, Westminster, S.W.
City Address: 182, Gresham House, Old Broad Street, LONDON, E.C.

JAMES LAWRIE & CO. supply Best SCOTCH CANNEL COALS, Best FIRE-CLAY RETORTS, BRICKS, TILES, and LUMPS; BOILER SEATING BLOCKS, FLUE COVERS, and SILICA BRICKS for SPECIAL FURNACE WORK; COKE BARROWS, BOGIES, and SMALL WAGONS.
Postal Address: 1, WHITTINGTON AVENUE, E.C.
Telegram Address: "EIRWAL LONDON."

W. C. HOLMES & Co., Huddersfield, AND 80, CANNON STREET, LONDON, Contractors for Gas-Works complete, Makers of Gasholders, Purifiers, Scrubbers, Condensers, Retort Fittings, &c., Improved Valves, Engines, and Exhausters. Also for Collingwood's Regenerative Retort-Settings.
*** See Advertisement p. 174 of this week's issue.
Cablegrams: "Ignitor London." Telegrams: "Holmes Huddersfield."

IRISH BOG ORE OXIDE OF IRON.

GAS PURIFICATION.

BALE, BAKER, & CO., direct Importers from Ireland. Sample and Price on application.
OXIDE PAINT, SULPHURIC ACID, & Chemicals.
120 and 121, NEWGATE STREET, LONDON, E.C.

SULPHURIC ACID.

JOHN NICHOLSON & SONS, Chemical Works, LEEDS, specially produce this ACID from BRIMSTONE, for making SULPHATE OF AMMONIA of high quality and *good* colour. Delivery in our own Railway Tank-Wagons or Carboys. Highest references and all particulars supplied on application.

OIL for the "Wells" or "Lucigen" Lamps.
HARDMAN AND CO., Miles Platting, MANCHESTER.

NOTICE TO ADVERTISERS.—COPY FOR ADVERTISEMENTS for the "JOURNAL" should be received at the Office *not later* than TWELVE O'CLOCK NOON ON MONDAY, to ensure insertion in the following day's issue.

Orders for Alterations in, or Stoppages of PERMANENT ADVERTISEMENTS should be received not later than the FIRST POST on SATURDAY.

CANNEL COAL, ETC.

JOHN ROMANS & SON, EDINBURGH.
Gas Engineers, supply all the most approved SCOTTISH CANNELS; also FIRE-CLAY GOODS, CAST-IRON PIPES, and other APPARATUS for GAS AND WATER WORKS.
Prices, &c., will be forwarded on application to No. 80, St. Andrew Square, Edinburgh, Newton Grange, near Dalkeith, } Scotland.

FRIEDRICH LUX, Ludwigshafen am Rhein; and at No. 142, Great Portland Street, London, W.
Lux's Gas Regulators for every consumption.
Lux's single-stem Pressure-Gauges.
Lux's Regulator for Gas-Engines.
Lux's Gas-Balance.
Lux's new Gas Regulator for Inverted Lamps; and other Apparatus for Gas Lighting, &c.

LIQUOR and Tar wanted.
Brotherton and Co., Ammonia and Tar Distillers, Leeds and Wakefield.

DRAWINGS, Tracings, Specifications, Quantities, &c., prepared by an experienced Engineering Draughtsman. Plans of Works made, copied, or enlarged. Blue copies made. Illuminated Addresses in first-class style. Writings of all kinds, Engrossments, &c.
Address J. L. Featherstone 173, Fentiman Road, London, S.W.

A YOUNG Man, who has had considerable experience in a Gas-Works, wishes to improve. Would not object to hard work, or Managership of a small Works.
Address No. 2063, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

YOUNG Man wants a Situation in a Country Gas-Works. Retort or outside work; used to large and small Works. Has a knowledge of fitting in works, and of service laying. Two years' reference from large works.
Address W. V., care of Manager, Gas-Works, Lydd, Kent.

WANTED, a good Gas Stoker used to Exhauster and Shovel Charging. None need apply, whose character will not bear investigation for sobriety. Wages 27s. per week; overtime paid.
Apply, stating whether married or single, to the Manager, Gas-Works, Ware, Herts.

WANTED, a reliable Man to Manage small Country Gas-Works single-handed. Wages, £1 a week, and House; more to be earned by Gas-Fitting.
Apply to J. A. Willis, Shipton-under-Wychwood, Oxon.

WANTED, a Competent Man as MAIN and SERVICE LAYER for a Gas and Water Works.
Applications, stating age and wages required, to be sent to Mr. Dickinson, Gas and Water Manager, Hindley Local Board, near Wigan.

DRAUGHTSMAN.

WANTED, at the Reading Gas-Works, a thoroughly experienced DRAUGHTSMAN conversant in the construction of modern Gas-Works.
Apply, enclosing testimonials or references, and stating experience, salary required, age, &c., to Mr. Edward Baker, Engineer and Manager.

LOUGHBOROUGH GAS COMPANY.

WANTED, a good Gas-Fitter (not for internal Work). One who can read the states of Meters, and who has been accustomed to lay Mains and Services, and do sundry Fittings on a Gas-Works. State Wages.
Apply to J. B. Ball, C.E., Manager.

GAS-FITTER.

WANTED, at once, a Junior Gas-Fitter, used to Compo. and Iron work, ordinary House-Fitting, and Service Laying. Must be able to read Meters. Constant employment if found suitable.
Address, stating age, wages required, and references, to the Engineer, Sheppy Gas-Works, near Sheerness.

WANTED, immediately, two good STOKERS, used to Gas-Engine and Exhauster and Shovel Charging. Abstainers preferred. Wages, 26s. per week; overtime paid.
Apply, stating age and if married, with references as to character and ability, to Mr. Harry Wimhurst, Manager, Gas-Works, Sleaford, Lincs.

BOROUGH OF ROTHERHAM.

THE Corporation require the Services of a GAS ENGINEER to manage the Gas and Water Undertakings.
Salary, £300 per annum.
Applications, with testimonials, to be sent to me on or before Thursday, the 28th inst. at noon.
By order,
H. H. Hickmott,
Town Clerk.
Council Hall, Rotherham,
Jan. 12, 1892.

J. & J. BRADDOCK, Globe Meter Works, Oldham.
First-Class Award, Melbourne Exhibition, 1889, for WET AND DRY GAS-METERS, STATION METERS, AND GOVERNORS, PRESSURE-GAUGES, STREET LAMPS AND PILLARS, &c.
Telegraphic Address: "Braddock, Oldham."

SADLER AND CO., LIMITED, Middlesbrough; Ulverston (Barrow); Portsmouth; Carlton; Stockton; 70, Wellington Street, Glasgow; 58, Fountain Street, Manchester; and 85, Water Street, New York. Tar Distillers, Manufacturers of all TAR PRODUCTS, ALIZARINE and other TAR COLOURS, BICHROMES, OXALIC ACID, ALKALIES, LIQUOR AMMONIA, AMMONIA SULPHATE, &c.
Head Office: Middlesbrough. Correspondence invited.

WORKS FOREMAN.

WANTED, for a Works making 80 millions per annum, a thoroughly competent Man as WORKS FOREMAN, to be capable of taking the entire supervision in the absence of the Engineer. Must be a strictly temperate man, and have had practical experience in the working of Regenerative Furnaces, Exhausters, &c., and understand the testing of Gas for Impurities. Good Mechanic. Wages, 35s. per week, with good House, &c., &c.
Foremen of over Six years' experience, apply, by letter, with recent testimonials, to No. 2062, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

SCRUBBER for Sale, in good condition. To be removed on account of extensions.
Particulars on application to No. 2058, care of Mr. King, 11, Bolt Court, Fleet Street, E.C.

FOR SALE, cheap—Two Gasholders, 35 ft. diameter by 12 ft. deep. Capacity, 11,500 cubic feet each. Also various other larger sizes.
Two PURIFIERS, 24 ft. by 16 ft. by 4 ft. 6 in. deep, with Valves and Connections.
Four PURIFIERS in a group, 16 ft. by 12 ft. by 3 ft. 9 in. deep, 12-inch Centre-Valve and Connections. Also various other sizes.
WASHERS, from 500,000 to 250,000 feet per diem.
CONDENSERS, from 500,000 to 10,000 feet per diem.
EXHAUSTERS, from 120,000 to 5000 feet per hour.
STATION METERS, from 100,000 to 1500 ft. per hour.
Would erect any of the above, and make practically equal to new.
Inquiries invited for any second-hand Gas Plant.
Apply to Saml. While (late Ashmore and While), 60, Queen Victoria Street, London, E.C.

THE Widnes Local Board are prepared to receive TENDERS for the supply of FIRE-CLAY RETORTS, BLOCKS, and BRICKS.
Specifications and Forms of Tender may be obtained from Mr. Carr, Gas-Works, Widnes.
Tenders, endorsed "Fire-Clay Goods," to be addressed to the Chairman of the Gas Committee, and delivered to the undersigned not later than noon on the 1st of February prox.
The Board do not bind themselves to accept the lowest or any tender.
H. S. Oppenheim,
Clerk.
Town Hall, Widnes,
Jan. 16, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

GRIMESTHORPE STATION.
Contract No. 4.
TO IRONFOUNDERS.

THE Directors of this Company invite TENDERS for the supply of CAST-IRON STANDARDS and other IRONWORK required for a Framing in the No. 1 Gasholder Tank at their Grimesthorpe Station.
Bill of Quantities may be obtained, and the Drawings may be seen at the Company's Offices upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed tenders, marked "Tender for Ironwork for Tank Framing," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, Jan. 30, 1892.
Hanbury Thomas,
General Manager.
Commercial Street, Sheffield,
Jan. 9, 1892.

SHEFFIELD UNITED GASLIGHT COMPANY.

GRIMESTHORPE STATION.
Contract No. 5.
TO JOINERS AND GENERAL BUILDERS.

THE Directors of this Company invite TENDERS for the construction of a TIMBER FRAMING in the No. 1 Gasholder Tank, at their Grimesthorpe Station.
Bill of quantities may be obtained, and the Drawings may be seen, at the Company's Offices, upon application to the Engineer, Mr. Fletcher W. Stevenson.
The Directors do not bind themselves to accept the lowest or any tender.
Sealed Tenders, marked "Tender for Timber Framing for Gasholder Tank," and addressed to the undersigned, must be delivered at the Company's Offices, by post, not later than Saturday, Jan. 30, 1892.
Hanbury Thomas,
General Manager.
Commercial Street, Sheffield,
Jan. 9, 1892.

MESSRS. DEBENHAM, TEWSON FARMER, and BRIDGEWATER'S MONTHLY LIST of Shops, Show-Rooms, Factories, and Waterside Premises, suitable for the Exhibition and Manufacture of Engineering and other Appliances, may be obtained, free of charge, at their Offices, 80, Cheapside, E.C.

COZE'S Automatic Apparatus for CHARGING AND DISCHARGING GAS-RETORTS. For Illustrated Advertisement of this System, see p. 176.
Inquiries should be addressed to The Automatic Coal-Gas Retort Company, Limited, 86-88A, Leadenhall Street, E.C.

THE Corporation of Middleton are prepared to receive TENDERS for the following Articles required at the Gas-Works during the ensuing year: WET and DRY GAS-METERS, STEAM TUBES and FITTINGS, RETORTS, FIRE-BRICKS and FIRE-CLAY.
The Retorts are to be delivered at the Middleton Railway Station; and the other Articles at the Gas-Works, Middleton (free of carriage).
Further particulars may be obtained from Mr. Duxbury, Gas Manager.
The Corporation do not bind themselves to accept the lowest or any tender.
Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Wednesday, the 17th day of February, 1892, endorsed "Tender for Meters," "Tubes," or "Retorts," as the case may be.
Frederick Entwistle,
Town Clerk.
Town Hall, Middleton,
Near Manchester, Jan. 22, 1892.

THE Corporation of Middleton are prepared to receive TENDERS for the supply of the SULPHURIC ACID required at the Gas-Works during the ensuing year.
Further particulars may be obtained from Mr. Duxbury, Gas Manager.
The Corporation do not bind themselves to accept the lowest or any tender.
Tenders, addressed to the Chairman of the Gas Committee, to be delivered at my Office on or before Wednesday, the 17th day of February, 1892, endorsed "Tender for Sulphuric Acid."
Frederick Entwistle,
Town Clerk.
Town Hall, Middleton,
Near Manchester, Jan. 22, 1892.

BOROUGH OF WEST BROMWICH.
(Gas Department.)

THE Gas Committee are prepared to receive TENDERS for the construction of a BRICK GASHOLDER TANK, 124 feet diameter, at their Gas-Works, Albion, West Bromwich.
Drawings and Specifications may be seen, and all information obtained, upon application to the Manager (Mr. Littlewood), at the Works, as above.
Tenders, properly endorsed, to be sent to me at the Town Hall, West Bromwich, not later than Thursday, the 11th prox.
The Gas Committee do not bind themselves to accept the lowest or any tender.
By order,
Thos. Hudson,
Secretary.
Town Hall, West Bromwich.
Jan. 9, 1892.

COUNTY BOROUGH OF SALFORD.
(Gas Department.)

RETORTS AND FIRE-BRICKS.

THE Gas Committee invite Tenders for the supply of RETORTS and FIRE-BRICKS required at their various Works.
Full particulars and Form of Tender may be obtained on application to the Gas Engineer, Gas Offices, Bloom Street, Salford.
Sealed tenders, endorsed "Fire-Clay Goods," addressed to the Chairman of the Gas Committee, to be sent to my Office, not later than Five p.m., on Thursday, the 4th of February next.
By order,
Saml. Brown,
Town Clerk.
Town Hall, Salford,
Jan. 16, 1892.

COUNTY BOROUGH OF BURNLEY.

THE Gas Committee of the Corporation of Burnley are prepared to receive TENDERS for the supply and erection at their Gas-Works of the following:—
1. One Complete set of CONDENSERS, capable of dealing efficiently with a make of 3,000,000 cubic feet of Gas per day.
2. Two EXHAUSTERS, with Engines, each to pass 75,000 cubic feet of Gas per hour, complete with Inlet and Outlet Valves, self-acting Bye-pass, and Compensating Governor.

Further information may be obtained from Mr. J. P. Leather, Gas Engineer, Gas-Works, Burnley.
The Corporation do not bind themselves to accept the lowest or any tender.
Tenders, endorsed "Condensers" or "Exhausters," as the case may be, to be sent in, addressed to the Chairman of the Gas Committee, Town Clerk's Office, Burnley, not later than Wednesday, the 27th of January, 1892.
By order,
Robert E. Fox,
Town Clerk.
Town Hall, Burnley,
Jan. 16, 1892.

The LIST will OPEN on the 27th and CLOSE on the 29th day of January, 1892.

The METROPOLITAN and BIRMINGHAM BANK, Limited, are authorized by the Trustees of the late Mr. John Wilkes to offer to the Public 337 Debentures of £100 each at £105, 3600 Preference Shares of £5 each, fully paid up, at £6 each, and 12,000 Ordinary Shares of £5 each, 4000 of which are fully paid up and 8000 are credited with £2 10s. paid up, at £6 each for the Shares fully paid, and £3 each for the Shares partly paid up. Payable, as to the Debentures, by £10 per Debenture of £100 on Application, and the balance on the 16th of February, 1892, the purchasers taking the Interest as from the 1st of January, 1892; and as to the Shares, on those fully paid up £1 per share, and on those partly paid up 10s. per Share on Application, and the balance on the 16th of February, 1892. The Shares will rank for Dividend from the 1st of January, 1892.

Applications for Ordinary Shares, in the proportions of two Shares, on which £2 10s. is paid up, to one Share fully paid-up, will be preferentially considered. Forms of Application can be obtained from the Bankers only.

JOHN WILKES, SONS, and MAPPLEBECK, Limited.

(INCORPORATED UNDER THE COMPANIES ACTS, 1862 to 1890.)

Nominal Capital £250,000, divided into 50,000 Shares of £5 each.

THE PRESENT ISSUE CONSISTS OF:—

25,000 £5 10s. per Cent. Preference Shares of £5 each (cumulative as to Dividend, and preferential as to Capital)	**£125,000**
6,100 Fully-Paid Ordinary Shares of £5 each	**30,500**
12,000 Ordinary Shares of £5 each, with £2 10s. paid up	**30,000**
	£185,500

The Company has power to issue 1250 Debentures of £100 each, at £4 10s. per cent. Interest, of which 1000 only have been issued at present, redeemable at six months' notice any time after the 1st of January, 1897, at £105.

Trustees for Debenture Holders.

G. F. BOLDING, Esq., Hagley Road, Edgbaston. | JOSEPH HINKS, Esq., Milverton Lawn, Leamington.

Directors.

J. T. COLLINS, Esq., Churchfield, Edgbaston, Chairman. | JAMES F. H. CARTLAND, Esq., Vectis Lodge, Edgbaston.
GEORGE WILLIAM WILKES, Esq., Knowle.

Managing Directors.

JOHN WILKES, Esq., Craven Lodge, Leamington. | EDWARD MAPPLEBECK, Esq., Ellerslie, Augustus Rd., Edgbaston.

Bankers.

METROPOLITAN & BIRMINGHAM BANK, Limited, London and Birmingham, and Branches.

Auditors.

DELOITTE, DEVER, GRIFFITHS, & Co., 4, Lothbury, London, E.C., Chartered Accountants.

Solicitors.

ROWLANDS & Co., 71, Colmore Row, Birmingham.

Secretary.

G. H. GODFREY, Bordesley Mills, Liverpool Street, Birmingham.

Registered Offices.

BORDESLEY MILLS, LIVERPOOL STREET, BIRMINGHAM.

PROSPECTUS.

THE Company has been formed for the purpose of acquiring the old-established businesses of John Wilkes and Sons, Bordesley Mills, Liverpool Street, Birmingham, and John Wilkes, Mapplebeck, and Co., Abberley Street, Birmingham, together with the Freehold Land, Works, Machinery, Stock-in-Trade, and effects belonging thereto respectively.

The trades carried on are those of Metal Rollers, Copper Smelters, Refiners, Manufacturers of Brass and Copper Sheets, Tubes, Wire, &c.

The businesses have been formed into a Limited Company for family reasons, consequent upon the death of Mr. John Wilkes. The terms of purchase were agreed in the autumn of 1891; and the delay in completing the matter has been caused by an application to the Court for an order to sanction the sale under the will of the late Mr. Wilkes, which has now been obtained.

Both concerns are taken over by the Company as from the 1st day of January, 1892. The profits for the year 1891 are to be paid to the Vendors by the Company when ascertained.

The purchase-money is £285,500, made up as follows:—

1. The Freehold Works called Bordesley Mills, in Liverpool Street, Birmingham, and the Freehold Copper and Tube Works, called the Cape Copper and Patent Brass Tube Works, in Abberley Street, Birmingham, together with the fixed plant attached thereto, which were valued by Mr. Thomson Plevins and Mr. H. J. T. Piercy, for Probate and Estate Duty purposes only, at	£103,700 0 0
2. The stock-in-trade, book debts, cash in hand and other property, after deducting all liabilities as on the 31st of December, 1890	115,462 10 9
Goodwill, two years' purchase, based on the average profits for the years 1888, 1889, and 1890	66,337 9 3
	£285,500 0 0

The stock-in-trade, finished and unfinished, was taken in the usual course of business on the 31st of December, 1890, and not for the purpose of transfer to a Company.

The book debts and liabilities on the same date will be accounted for to the Company as certified by Messrs. Deloitte, Dever, Griffiths, and Co., of 4, Lothbury, London, Chartered Accountants, who have audited the books of the businesses for many years.

The following is a copy of their Certificate as to the profits:—

4, Lothbury, London, E.C., Dec. 16, 1891.

To the DIRECTORS of JOHN WILKES, SONS, AND MAPPLEBECK, LIMITED.

GENTLEMEN,—We have for many years regularly audited the accounts of the businesses carried on by Messrs. J. Wilkes and Sons, Bordesley Mills, Birmingham, and by Messrs. J. Wilkes, Mapplebeck, and Co., Abberley Street, Birmingham; and we certify that, after providing for all expenses, but excluding charges for rent of freeholds, partners' salaries, interest on capital, and reserves for depreciation, the profits earned by the two businesses during the three years ended 31st December, 1890 were as follows:—

Year ended Dec. 31, 1888	£21,841
,, ,, 1889	43,090
,, ,, 1890	34,380
	£99,311
Showing an average annual profit of	£33,103

Your obedient servants,
(Signed) DELOITTE, DEVER, GRIFFITHS, AND Co.,
Chartered Accountants.

The whole of the purchase-money has been paid to the Vendors in Debentures and Shares as follows:—

1,000 Debenture of £100 each, 213 carrying interest at £5 per cent., and 787 at £4 10s. per cent.	£100,000
25,000 Preference Shares of £5 each, carrying a cumulative Preferential Dividend of £5 10s.	125,000
18,100 Ordinary Shares of £5 each, viz.:—	
6100 fully paid	£30,500
And 12,000 ditto, £2 10s. paid up	30,000
	£60,500
	£285,500

The Debentures are secured by a Debenture Trust Deed, which comprises the whole of the Company's Freehold Works, Stock-in-Trade, Book Debts, and Undertaking, including uncalled Capital. The Interest will be payable half yearly on the 1st day of January, and the 1st day of July. The Debentures may be redeemed at £105 by the Company on giving six months' notice at any time after the 1st day of January, 1897. In the meantime the surplus profits, after paying the interest on the Debentures, the Dividend on the Preference Shares, and a Dividend not exceeding 10 per cent. per annum on the Ordinary Shares, can be accumulated as a Reserve Fund for the purpose of redeeming the Debentures.

Messrs. John Wilkes and Edward Mapplebeck, by whom the businesses have been managed for a number of years past, will act as Managing Directors for a period of at least five years from the 1st day of January, 1892.

The Contract for the purchase of the businesses and property is made between John Wilkes, George William Wilkes, and Edward Mapplebeck of the one part, and the Company of the other part, and is dated the 17th day of December, 1891.

Copies of this Contract, of the valuations of Mr. Plevins and Mr. Piercy, the certificate of Messrs. Deloitte, Dever, Griffiths, and Co. of the Memorandum and Articles of Association, and the Trust Deed for securing the Debentures, may be inspected at the Offices of the Company's Solicitors, Messrs. ROWLANDS AND Co., 71, Colmore Row, BIRMINGHAM.

Bordesley Mills, Liverpool Street, Birmingham,
Jan. 19, 1892.

CITY OF MANCHESTER.

TENDERS FOR CAST-IRON PIPES.

THE Gas Committee are prepared to receive, on or before the 4th of February next, TENDERS for the immediate supply of about Two thousand tons of CAST-IRON PIPES of 12, 24, and 30 inches diameter.

Specifications and Forms of Tender may be obtained on application (in writing only) to Mr. Charles Nickson, Superintendent, Gas Department, Town Hall, Manchester.

By order,
WM. HENRY TALBOT,
Town Clerk.

Town Hall, Manchester,
Jan. 23, 1892.

THE Directors of the Eccleshill and Bolton Gas Company are prepared to receive separate TENDERS for the construction and erection of a SINGLE and a TWO-LIFT GASHOLDER, 77 feet diameter.

The Drawings and Specification may be inspected on application to J. Lee, Gas-Works, Eccleshill.

Sealed tenders, endorsed "Gasholder," and addressed to Wm. Smith, Esq., Chairman, are to be delivered on or before Twelve o'clock noon, on Thursday, the 28th day of January next.

The Directors do not bind themselves to accept the lowest or any tender.

J. LEE,
Engineer.

Gas-Works, Eccleshill,
Jan. 14, 1892.

PENRITH LOCAL BOARD.

THE Gas Committee of the Penrith Local Board are prepared to receive TENDERS for the construction and erection of a GASHOLDER and TANK and other APPARATUS at the Gas-Works, Penrith.

Plans and Specifications may be seen at the Offices of the Local Board, or on application to Mr. J. Hepworth, C.E., Gas-Works, Carlisle.

Tenders, endorsed "Tender for Extensions," must be delivered to me not later than the 8th day of February, 1892.

The lowest or any tender will not necessarily be accepted.

By order,
GEO. WAINWRIGHT,
Clerk to the Board.

Public Offices, Penrith,
Jan. 15, 1892.

THE GASLIGHT AND COKE COMPANY.

NOTICE is hereby given, that a HALF-YEARLY ORDINARY GENERAL MEETING of the Proprietors in this Company will be held at this Office, on Friday, the 5th day of February next, at Twelve o'clock noon precisely, to transact the usual business, including the declaration of a Dividend for the Half Year ending the 31st day of December last, and to elect Directors and Auditors in the place of those who will at such meeting go out of office, in compliance with the Company's Acts or Schemes of Amalgamation.

By order,
JOHN ORWELL PHILLIPS,
Secretary and General Manager.

Chief Office: Horseferry Road,
Westminster, S.W., Jan. 19, 1892.

RE W. G. KENT, ESQ., DECEASED, AND OTHERS.
GAS SHARES IN THE:
West Ham Gas Company,
Crystal Palace District Gas Company,
Walton-on-Thames and Weybridge Gas Company, and in the
Albo-Carbon Light Company, which will be sold by Auction by

MR. ALFRED RICHARDS. at the Mart, E.C., on Tuesday, Feb. 9, at One, in lots.

Particulars of Messrs. HORSLEY AND WEIGHTMAN, Solicitors, 1, GUILDHALL CHAMBERS, E.C., and of the AUCTIONEER, 18, FINSBURY CIRCUS, E.C.

Price 2s. per dozen, or 10s 6d. per 100, post free.

CONSPIRACY and Protection of Property Act. It is required, under a Penalty of FIVE POUNDS, that a Printed Copy of the 4th Section of this Act shall be posted up at all Gas-Works, in a conspicuous place, where the same may be conveniently read by the persons employed thereat.

Printed copies of this Section, in large type, on broad sheets, may be obtained of WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

*** *The Act extends to Scotland and Ireland.*

Now Ready, Price 6s., Bound in Cloth.

THE CHEMISTRY OF ILLUMINATING GAS,

By
NORTON H. HUMPHRYS, Assoc. M. Inst. C.E., F.C.S.

This work contains chapters on: The Relative Cost of Light from Gas, Oil, and Candles; Products of Combustion; The Sulphur Question; The Composition of Illuminating Gas; Water Gas; Various Gas-Making Processes; Oil Gas; Properties of Fluid Hydrocarbons; Tar for Gas-Making; Destructive Distillation; Condensation; and Purification.

London:
WALTER KING, 11, Bolt Court, FLEET STREET, E.C.

MR. W. H. BENNETT having had considerable experience in matters connected with Gas, Water, and Sanitary Improvement, begs to say that he continues to assist Inventors in the perfection of their designs, and to obtain for them PROVISIONAL PROTECTION, whereby their Inventions may be secured for Twelve months; or LETTERS PATENT, which are granted for Fourteen Years.

Patents completed, or proceeded with at any stage, thereby rendering it unnecessary for persons resident in the country to visit London.

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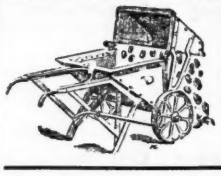
Information as to cost, &c., supplied gratuitously upon application to the Advertiser, 22, Great George Street, WESTMINSTER.

PRICE'S PATENT COKE & COAL BARROW



effecting a great saving of time, labour, and expense.

For particulars, price &c., apply to Mr. E. PRICE, Inventor and Patentee, 22, Alwyne Road, Canonbury, LONDON, N.

Prices are Reduced.

AUG. KLÖNNE,

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REGENERATIVE FURNACES.

Unsurpassed in
Efficiency, Economy, Durability, and Easy Working.

MEIKLEJOHN'S PATENT

Improved Slide-Valve Anti-Dip.

Is perfectly reliable in action, and requires no attention. Has all the advantages of the Dip and Anti-Dip combined.

Is cheap and easily fixed to any form of main.

Will be found the most efficient appliance of the kind yet introduced.

Further particulars and price from

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OLDBURY, BIRMINGHAM.
(Late N. MEIKLEJOHN, Longwood.)

UNEQUALLED.

Gas Companies are solicited to try Samples of the

MIRFIELD

BLACK BED GAS COAL.

Prices and Analysis on application.

MIRFIELD (GAS-COAL) COLLIERY COMPY.
MIRFIELD, NORMANTON.

PATENTS FOR INVENTIONS,

REGISTRATION OF TRADE MARKS and DESIGNS in all Countries.

SEARCHES made *re* novelty, and opinions given on all matters connected with above. *Full particulars on application to*

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Assoc.M.Inst.C.E., M.Inst.M.E., Chartered Patent Agent,
70, CHANCERY LANE, LONDON, W.C.

Special experience in Gas and Ammonia Plant.

THOMAS ILLINGWORTH,

NORTH DEAN CHEMICAL WORKS
Near HALIFAX,
MANUFACTURER OF SULPHURIC ACID
OF EXTRA QUALITY FOR MAKING
WHITE SULPHATE OF AMMONIA.

TAR, LIQUOR, AND SPENT OXIDE
Purchased for Cash against Delivery.

FIRE-BRICKS.

FIRE-CLAY.

JAMES WHITE & Co., Limited,
Albert Oil-Works,
WIDNES, LANCASHIRE,
Sole Proprietors of the Largest and Purest Beds of Fire-Clay in England.

FOR GAS FURNACES our GANNISTER and SILICA FIRE-BRICKS are acknowledged to be the best and most durable in the market.

GANNISTER and SILICA FIRE-CLAY guaranteed of the Purest and Finest Quality.

ANALYSIS AND REFERENCES ON APPLICATION.

COKE BREAKERS.

G. R. Mather & Son, Engineers, Wellingboro'.

Wrought-Iron

And Fittings and Accessories.

LAMBERT BROS., WALSALL,

MANUFACTURERS OF
WROUGHT-IRON TUBES & FITTINGS for GAS, WATER, & STEAM,
BRASS GAS-FITTINGS, GAS-VALVES, STEAM & WATER VALVES, TOOLS, &c.; AND OF
WARNER'S PATENT MARKET GAS STAND-PIPE.
LONDON: LAMBETH BRASS & IRON CO., Short Street, LAMBETH.

JOHN BROWN & CO., LTD., SHEFFIELD,

Proprietors of

ALDWARKE MAIN CAR HOUSE & ROTHERHAM MAIN COLLIERIES, NEAR ROTHERHAM.

ALDWARKE MAIN GAS COAL

Analysis: 12,600 feet of 19-candle gas per ton.
Weight of illuminating power in pounds of sperm, 820·80. Very free from impurities.
Telegrams: "ATLAS SHEFFIELD."

GASHOLDERS

C. & W. WALKER

Have erected Gasholders of all dimensions, during the last 40 years, in all parts of Great Britain, and throughout the civilized world, for upwards of 500 Gas Companies and Municipalities; all of the best materials and highest class of workmanship.

They are now erecting a four-lift Holder of about 8 MILLION cubic feet, at the Beckton Gas-Works, London.

MIDLAND WORKS, DONNINGTON, near NEWPORT, SHROPSHIRE,
AND
8, FINSBURY CIRCUS, LONDON.

HOLMSIDE GAS COALS.
(Wrought out or Holmside and South Moor Collieries.)

PRESENT production nearly 3000 tons per working day. Area of coal about 5000 acres, including the largest remaining workable proportion of pure HUTTON SEAM GAS COAL. Analysis of HOLMSIDE GAS COAL *in bulk as shipped* gives 10,500 cubic feet of Gas per ton, of an Illuminating Power of 16½ candles. The Sulphur is about 1 per cent., and the Ash 1¾ per cent. The Coal cokes well, and leaves 69 per cent. of excellent Coke. During the year 1890, the London Gas Companies carbonized about 400,000 tons of HOLMSIDE COALS. They are used by The Gaslight and Coke Company, the South Metropolitan Gas Company, the Commercial Gas Company, the Woolwich (Government) Gas-Works, the Newcastle and Gateshead Gas Company, the European Gas Company, the Ipswich Gas Company, and by many other Gas Companies both at Home and Abroad.

MR. MARK ARCHER,
HOLMSIDE AND SOUTH MOOR OFFICES,
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NEWBATTLE CANNEL.

QUOTATIONS ON APPLICATION TO

THE LOTHIAN COAL COMPANY,
LIMITED,
NEWBATTLE COLLIERIES,
DALKEITH, N.B.

T. B. KITTEL, SHEFFIELD.
CONTRACTS FOR SUPPLIES OF ANY OF THE PRINCIPAL
ENGLISH & SCOTCH CANNELS.
REAL SILKSTONE GAS COAL
ANALYSIS AND PRICES ON APPLICATION.
T. B. KITTEL, SHEFFIELD.

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Sheaf & Spring Works,
SHEFFIELD,
MANUFACTURERS OF
FILES OF BEST QUALITY
FOR ENGINEERS.
STEEL OF ALL DESCRIPTIONS.
SCREW STOCKS, TAPS AND DIES,
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ALFRETON IRON-WORKS, DERBYSHIRE,
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Manufacture and keep in Stock at their Works (also large stock in London)
PIPES and CONNECTIONS, 1¼ to 48 inches in diameter; and make and erect to order RETORTS, PURIFIERS and TANKS, with or without planed joints, COLUMNS, GIRDERS, SPECIAL CASTINGS, &c., required by Gas Water, Railway, Telegraph Chemical, Colliery, and other Companies.

NOTE. — Makers of HORSLEY'S PATENT SYPHONS. These are cast in one piece, without Chaplets; doing away with bolts, nuts, and covers, and rendering leakage impossible.

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MANUFACTURE
SILICA BLOCKS,
BRICKS, AND CEMENT
OF SUPERIOR QUALITY
FOR GAS-FURNACES.

Trade Mark: "SILICA."

These Goods (largely used in Gas, Glass, Iron, and Steel Works) are, on account of their
GREATER DURABILITY,
Strongly recommended where EXCESSIVE HEATS have to be maintained.

WALLER'S PATENT FOUR-BLADE GAS EXHAUSTER,
From 40,000 to 250,000 feet per hour.
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From 5000 to 35,000 feet per hour.
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From 1000 to 250,000 feet per hour.
WALLER'S Patent WASHER-SCRUBBER & Tar Extractor Combined
FITTED WITH
WOOD CLUSTERS for efficiency and **LIGHTNESS.**
WALLER'S Patent Combined GAS ENGINE and Exhauster,
With Disc Valves, Bye-Pass Valve, Throttle Valve, and Regulator, all Complete on One Base Plat
Machinery for Elevating and Conveying Coal, Coke, Oxide, Lime.

G. WALLER & CO., ENGINEERS, FOUNDERS, BOILER MAKERS,
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GAS COAL AND CANNEL CONTRACTOR,
PATENTEE OF
A SPECIAL COMPOUND for the cure of Stopped Ascension-Pipes,
A couple of charges of which will clear a stopped pipe, and an occasional charge keeps them clean, and also increases the make per ton and the illuminating power.
Price and particulars on application. **Head Office: CORPORATION STREET, BIRMINGHAM.**

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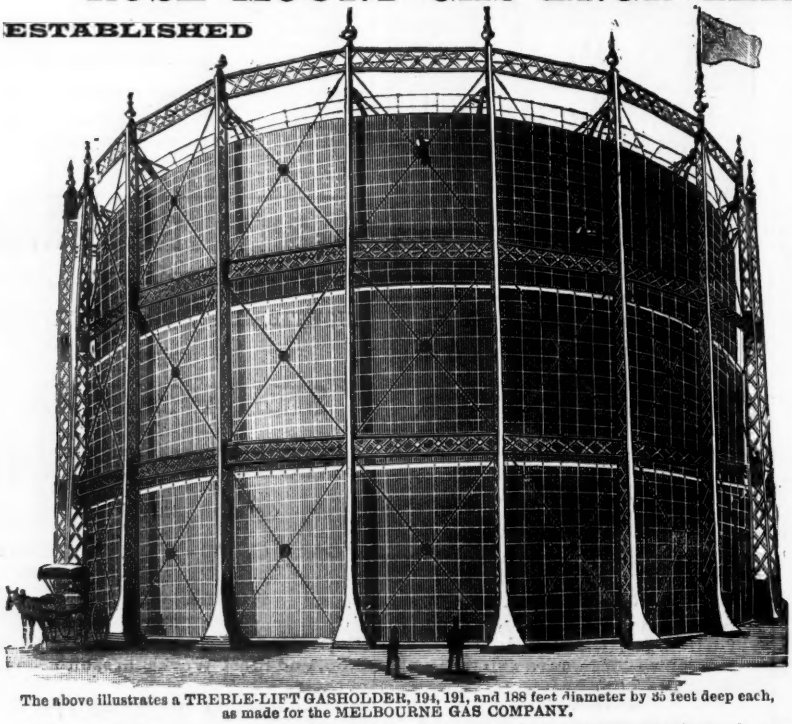
ROSE MOUNT GAS ENGINEERING WORKS.
ESTABLISHED **1855.**



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SULPHATE PLANTS,
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The Gasholder sheets are levelled by machinery, and are afterwards sheared, squared, and punched by an Improved Combined Multiple Punch and Shearing Machine, which also punches the circumferential seams of crown sheets by special punches and dies, ensuring perfect accuracy, avoiding rimering in erection.

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Manufacturers of GAS-RETORTS, GLASSHOUSE FURNACE & BLAST-FURNACE BRICKS, LUMPS, TILES, and every description of FIRE-BRICKS.
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SHIPMENTS PROMPTLY AND CAREFULLY EXECUTED.

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TYNE BOGHEAD CANNEL.

Yield of Gas per ton	13,155 cub. ft.
Illuminating Power	38·22 candles.
Coke per ton	1,301·88 lbs.

EAST PONTOP GAS COAL.

Yield of Gas per ton	10,500 cub. ft.
Illuminating Power	16·3 candles.
Coke	70 per cent.

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Manufacturers of the "Thomas" Patent Lamps for general lighting, also for Public Buildings, Institutions, &c., and for outside purposes.

The best Regenerative Lamp in the Market.

Special quotations to Gas Companies.

PUBLIC HEALTH.

10,000,000 GALLONS
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PURE SPRING WATER
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CANNEL COAL MERCHANT,
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Prices and Analysis of all the Scotch Cannels on application.

CAST-IRON PIPES
FOR GAS AND WATER.
Pipes, One to Six inch Bore, kept in Stock. Also a very large assortment of all sizes of Bends, T-pieces, and Specials ready for despatch on receipt of Order.

VALVES
FOR GAS, WATER, AND STEAM.

TELEGRAMS: "PIPES GLASGOW."
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Lanemark Coal Co.,
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LANEMARK CANNEL AND GAS COALS.

Quotations and Analysis on application to
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NEW CUMNOCK, N.B.

Shipping Ports: All the principal Scotch Ports.

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LUMPS, TILES,
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Special Bricks for Intense Heats.

GAS RETORTS.

CASTINGS AND EVERY REQUISITE FOR **GAS-WORKS.**

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☛ **Retort Setters sent to any part of the Kingdom.**

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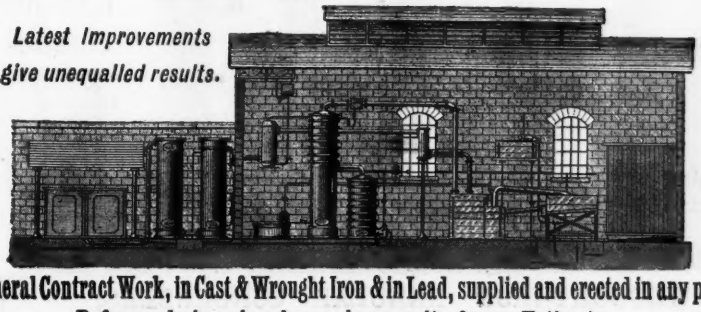
GAS ENGINEER.

Sole Licensee of
WILTON'S PATENT
SULPHATE OF
AMMONIA DISCHARGER.
OVER 50 APPARATUS WORKING.

Latest Improvements give unequalled results.



SULPHATE OF AMMONIA APPARATUS OF THE MOST MODERN CONSTRUCTION.
REFERENCES, &c., ON APPLICATION.

Gas-Making Apparatus & General Contract Work, in Cast & Wrought Iron & in Lead, supplied and erected in any part of the United Kingdom.
Before ordering elsewhere, please write for an Estimate.

SPENT LIMES NO LONGER WASTE PRODUCTS.

Under G. R. HISLOP'S PATENTS

All Spent Limes are most effectually, economically, and continuously recovered, and at from one-third to one-half the cost of New Lime. The results are a surprise to all who have inspected the process, and are entirely satisfactory to all now using it. Descriptive Pamphlet and Terms from Agents as under.

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Hislop's Patent Producer and Patent Charging Appliances offer advantages which are unapproachable; while in every other detail his Settings are confidently recommended as being the most inexpensive and effective possible.

Illustrated Pamphlet and Terms on application to J. E. FISHER, Stourbridge, Agent for England and Wales; to C. M. HAMILTON, Portland Place, Hamilton, Agent for Scotland and Ireland; and for all other Countries to the Patentee,

Geo. R. HISLOP, Gas Engineer, PAISLEY, N.B.

HANNA, DONALD, & WILSON,

(Established 1851),

GAS ENGINEERS & CONTRACTORS,

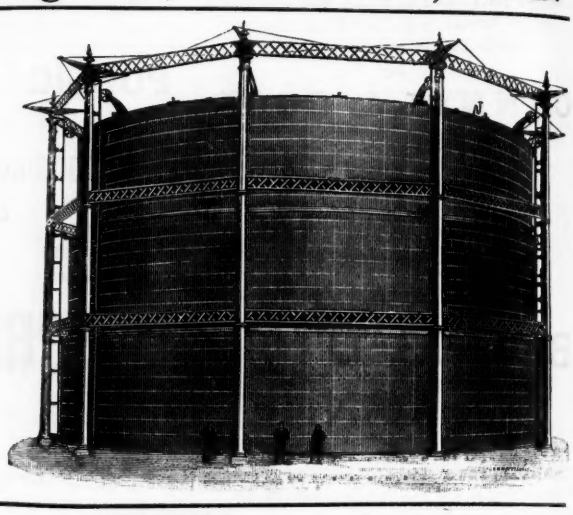
Abercorn Foundry and Abbey Works,

PAISLEY, N.B.,

MAKERS OF

Gasholders and Gas Plant

OF EVERY DESCRIPTION.



Telegraphic Address: "Donald Paisley."

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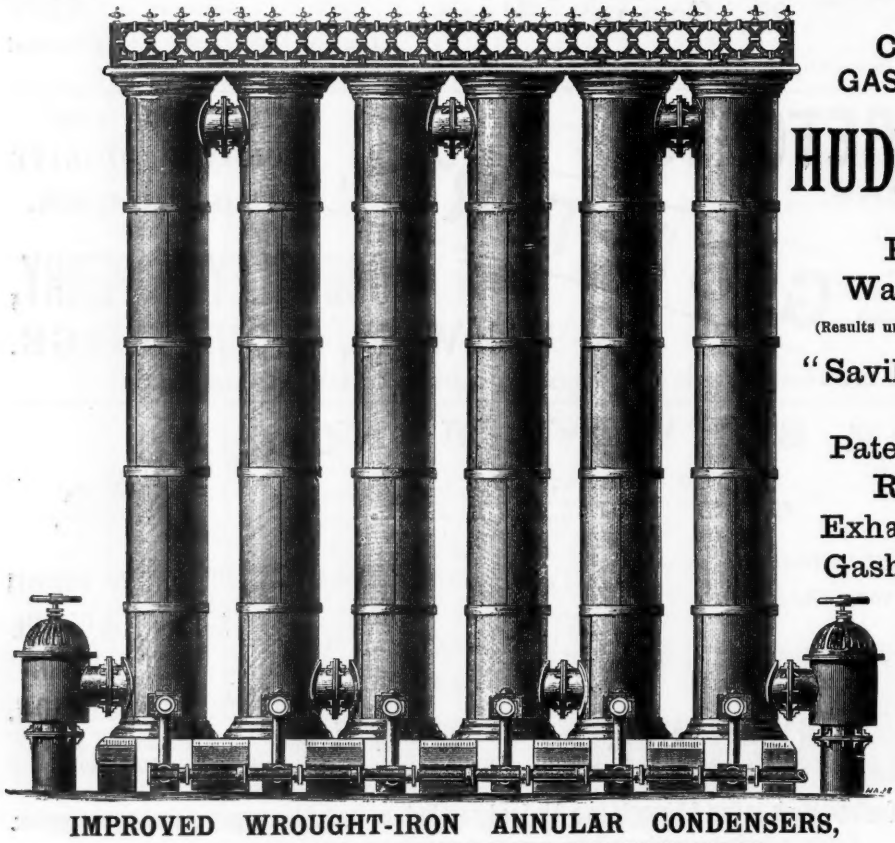

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WITH WING VALVES, TO REGULATE THE CONDENSING POWER.

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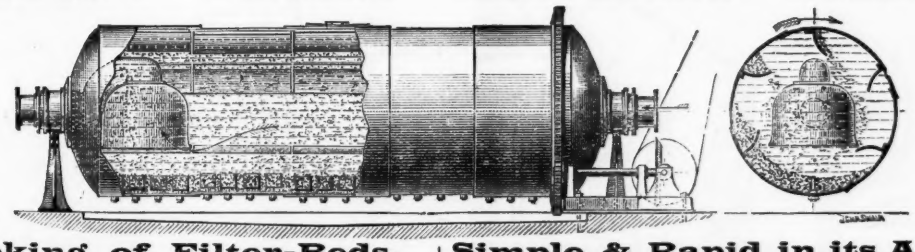

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THE AUTOMATIC SYSTEM OF
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GOLD MEDAL, PARIS EXHIBITION, 1889.

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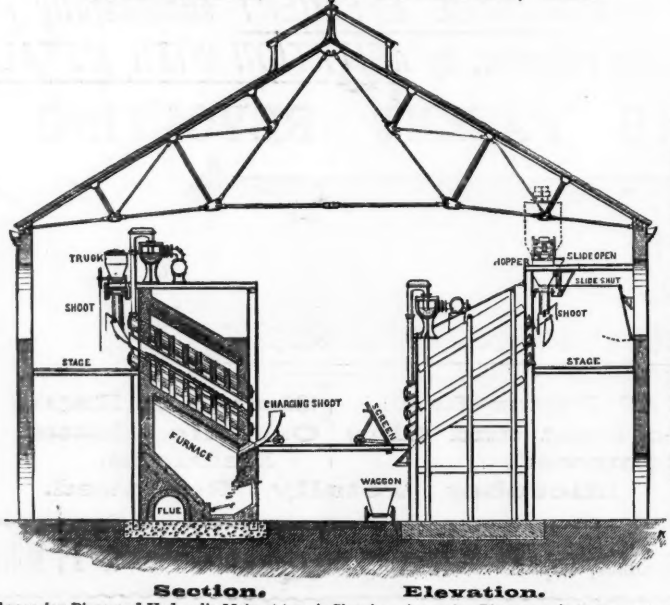

Advantages–

1. NO SKILLED LABOUR REQUIRED.

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6. SAVING OF 50 PER CENT. IN SPACE OF PERMANENT BUILDINGS.

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The whole worked from Stage. With or without Regenerative Settings.

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PREPAYMENT GAS-METER.

(PRICE'S PATENT.)

This Meter has a simple Automatic arrangement fitted, whereby, upon the insertion of a shilling, a supply of gas can be obtained, and which is cut off on the quantity paid for being consumed. The Meter gives warning when the quantity is nearly exhausted, so that another shilling may be inserted. There is, however, no occasion to wait until this happens, as a second shilling can be inserted after two-pennyworth of the first shilling has been consumed.

The Meter is fitted with the ordinary registering dial, and has in addition a circular one divided showing twelve pence. On each Meter is marked the number of cubic feet it will pass for one shilling; and this can be arranged to cover cost of Meter-Rental, Fitting, and Gas consumed. These Meters are made of the best material and workmanship.

SPECIALLY ADAPTED FOR INCREASING CONSUMPTION AMONGST SMALL CONSUMERS.
NO RISK OF BAD DEBTS.

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ADVANTAGES.

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No Costly Excavation.
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Fifteen per cent. Coke Saved.
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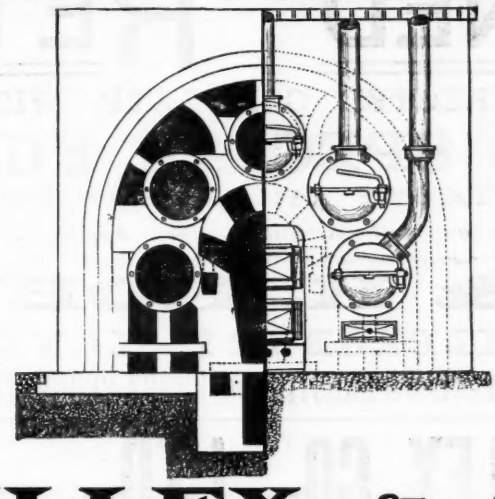
Easily adaptable to existing Arches, for Settings of three, four, five, and six Retorts.



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Roofs.
Condensers.
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Station Meters and Governors.
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Consumers' Wet and Dry Meters, of special excellence.
Gas-Fittings of every description.

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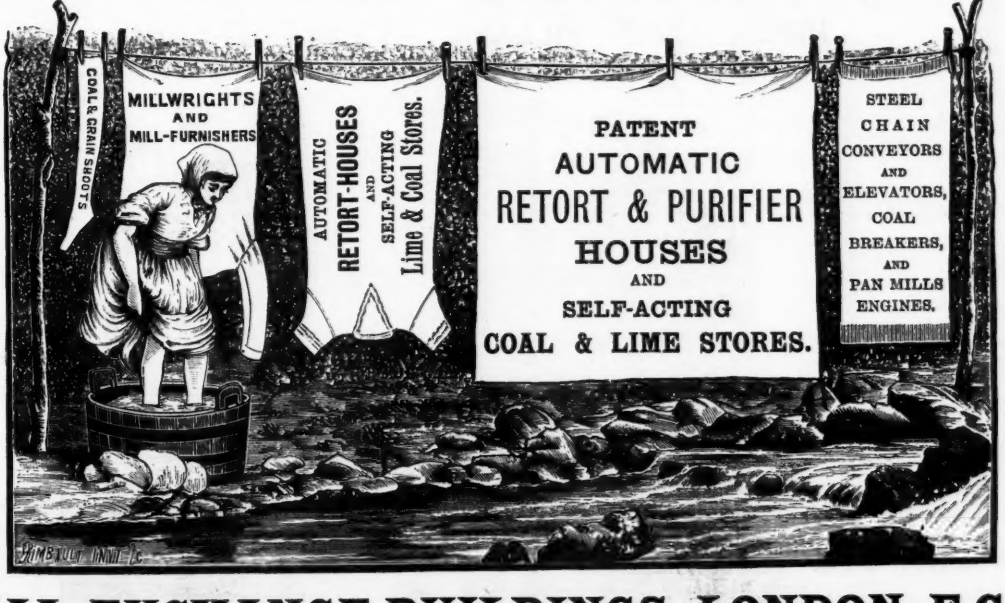
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ESTABLISHED 1825.

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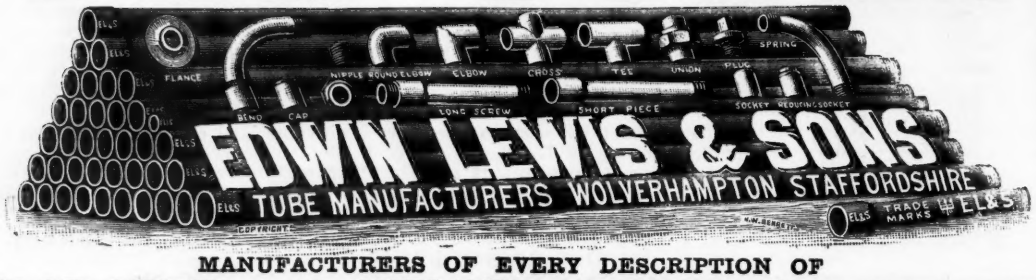

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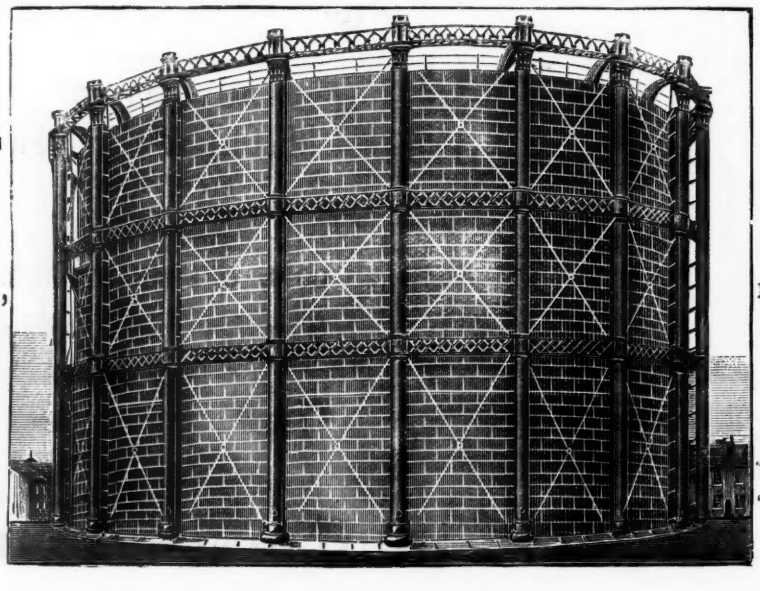

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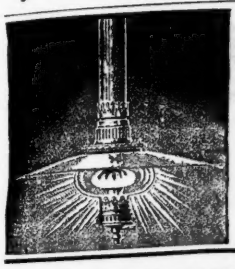

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HIGH-POWER GAS-LAMP.

The attention of Gas Engineers is particularly called to this Lamp as being the **cheapest, most simple, durable, and adaptable Lamp in the market.**
Two sizes, consuming 6 feet and 9½ feet per hour respectively.

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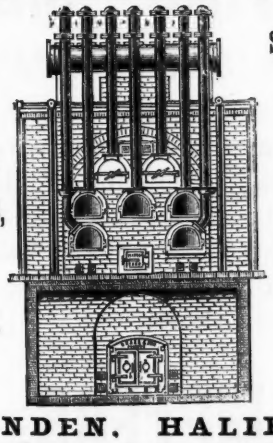

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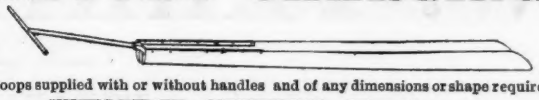
RETORT CHARGING.



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Delivery and Suction Hose, Gutta-Percha Acid Bottles, Leather Driving Bands, Woven Canvas Hose for Fire-Engines, Wedge and Square Gas-Bags, Air and Water Beds for Invalids, Oil Tarpauling Coats, Trousers, Hats, &c., Squeegees for cleansing Pavements, &c., Billiard and Bagatelle Cush, Tricycle Tyres, Leather Hose, Cotton Waste, Engine Cloths, Oils, &c., India-rubber Waterproof Garments for Walking, Driving, or Sporting Wear, Diving and Wading Dresses, Printers' Blankets, Iron Wheels and Rollers covered with India-rubber, and Stokers' Gloves.
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WELL LAMPS, STREET NAME TABLETS,
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Improved High-Power Lanterns for Lighting Street Refuges and Open Spaces.

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LAMPLIGHTERS' TORCHES.

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PUTTYLESS STREET LAMP.
This Lamp may be supplied fitted with clear opal, or ribbed glass, *as also with enamel tops* if required. The necessary fittings for altering existing Lamps to this system can be supplied at moderate prices.

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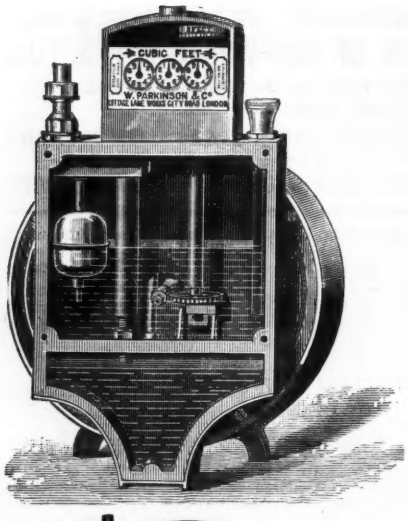

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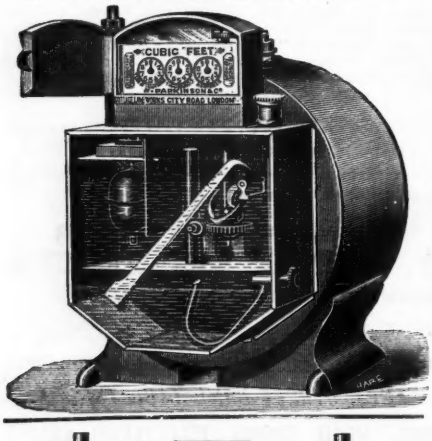
IN CAST-IRON CASES.

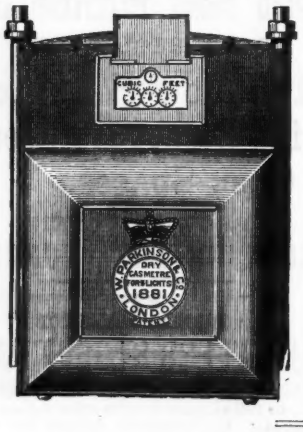
Work with very little friction. Will stand very high pressures. Cannot possibly be shut off by sudden increase of pressure, the Float being affected by Outlet Gas only. Allow for loss of water by evaporation without materially affecting the registration or shutting off the gas. Unexcelled for simplicity of construction, excellence of workmanship, or accuracy in registration.



COMPENSATING METERS

IN TINNED OR CAST-IRON CASES.

The Slow-Spoon Compensator has been in extensive use for many years; it maintains an unvarying water-line without appreciable friction, and provides a large reserve of water. The Float arrangement allows sudden or excessive pressure on the Inlet without affecting the working of the Meter or extinguishing the Lights.



DRY METERS.

These Meters are unsurpassed for accuracy of registration. The cases are made of the best Charcoal Tin Plates; and each part of the Meter is stamped by special Machinery to ensure uniformity and exactness in construction. The Diaphragms are all of the best Persian Sheep Skins, carefully selected and the brasswork and smaller fittings are of superior workmanship.

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Telegraphic Address: "PRECISION."

[See also Advt. p., 146.

London: Printed by WALTER KING (at the office of King, Sell, and Railton, Ltd., 12, Gough Square); and published by him at No. 11, Bolt Court, Fleet Street, in the City of London.—Tuesday, Jan. 26, 1892.